






The mangal flora diversity of Del Carmen Forest on Siargao Island, Philippines


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Abstract. The municipality of Del Carmen, Siargao Island, hosts one of the Philippines' most important contiguous mangrove stands. However, there is limited knowledge about the area's floral assemblages and communities. Hence, we provide a comprehensive species list through exhaustive botanical explorations within its 11 barangays. We report 166 species in 145 genera and 73 families, of which 20 are true mangrove species. Twenty species are Philippine endemics, and seven are threatened based on the IUCN listing. The most dominant families in the area in terms of density are Rhizophoraceae and Rubiaceae, and the dominating species include *Rhizophora mucronata* Lam. and *R. apiculata* Blume. Our results exhibit a very high diversity for the entire municipality, with barangays Del Carmen and Katipunan demonstrating the highest diversity among the 11 barangays. We emphasize the value of floristic surveys as essential baseline information in formulating effective conservation and management strategies for these vital wetland ecosystems.

Keywords. Checklist, mangroves, Philippine biodiversity, protected area, Surigao del Norte, vegetation analysis

Academic editor: M. Nazre

Received 26 July 2023, accepted 3 December 2023, published 7 December 2023

Cortez GNG, Ordas JAD, Zamudio SGS, Caguioa CDD, Rodriguez MAA, Rubite RR, Tandang DN, Moran CB (2023) The mangal flora diversity of Del Carmen Forest on Siargao Island, Philippines. Check List 19 (6): 983–1011. <https://doi.org/10.15560/19.6.983>

Introduction

Mangroves are highly productive wetland ecosystems providing ecological and economic services to locals and other organisms. The ecological services indirectly cater to locals, such as protection from tropical cyclones, rising sea levels and storm surges, prevention of coastal erosion and saltwater intrusion to terrestrial lands, and sediment regulation (Alongi 2015). Direct ecological services are associated with marine

and terrestrial organisms, as they function as nurseries and habitats (Tomlinson 2016). Mangrove systems provide free economic resources to at least US \$1.6 billion annually (Polidoro et al. 2010). The economic services of mangroves expand from ecotourism, agriculture, fisheries, and forestry (Tomlinson 2016). Unfortunately, mangroves are subject to overexploitation due to their services and location. Between 2000 and 2012, the mangroves of Southeast Asia alone suffered a decline of an average of 0.18% per year (Richards and Friess

2016). The trend of deforestation imposes the realization to intensify the conservation efforts of the remaining diverse mangrove forests. Floral diversity studies are effective prerequisites in understanding mangrove vegetation structure for science-based conservation and management plans.

As an archipelago with wide-ranging coastal zones, the Philippines is an ideal environment to support mangrove growth (Long et al. 2016). The Philippines exhibits high mangrove diversity in the Indo-West Pacific region. At least 35–40 true mangrove species are found in the Philippines (Primavera et al. 2004). Of the 7,014,152 ha of total forest in the Philippines, approximately 303,373 ha is accounted for mangrove forests. The greatest extents of mangrove systems are in Quezon (18,448 ha), Palawan (59,421 h), Surigao Del Norte (13,913 ha), Sulu (29,531 ha), and Tawi-Tawi (14,285 ha) (Department of Environment and Natural Resources, Forest Management Bureau 2018). Among these provinces, the Palawan mangroves are well documented and assessed to be highly diverse, whereas others have limited floral data (Dangan-Galon et al. 2016). Siargao Island in Surigao Del Norte exhibits about 8,000 ha total mangrove area. Half the concentration is in the contiguous mangrove forest in the Municipality of Del Carmen (Department of Environment and Natural Resources 2015). However, the floral knowledge of the Del Carmen Mangrove Forest needs to be more extensive and updated.

The eastern region of Siargao Island is internationally recognized for its surfing spots, whereas its western-bound contiguous mangrove stands are lesser known and await botanical exploration. The Del Carmen Mangrove Forest of Siargao Island, covering 4,295 ha, is part of the Siargao Islands Protected Landscapes and Seascapes (SIPLAS; Department of Environment and Natural Resources 2015). Despite the national-level protection, there is a lack of published floristic studies on the contiguous mangrove forest. A rapid plant assessment in 2013 was limited to the watershed area of Del Carmen; it identified 112 species consisting of 110 angiosperms, one gymnosperm, and one fungus (Department of Environment and Natural Resources 2015). The floral knowledge on mangrove species is narrowed to the evident and pure stand-forming plant species, notable species such as the *Rhizophora apiculata* Blume and *Rhizophora mucronata* Lam., and *Nypa fruticans* Wurmb. With the broad coverage and distinctive mangrove communities, preconceived assumptions exist about its rich diversity. However, more than mere sighting is needed to assess the floristic composition of the extensive mangal site. Hence, botanical field surveys should be conducted in the unique wetland. A better understanding of the flora of Del Carmen Mangrove Forest will lead to better conservation practices and support for its Ramsar recognition. The expansion of floral knowledge on the contiguous mangrove stands should remain consistent and gradual.

Study Area

Siargao Island is northeast of Mindanao in Surigao del Norte, Philippines. It is home to one of the largest mangrove forests in the Philippines, the Del Carmen Mangrove Forest located in the municipality of Del Carmen (09°55'45"N, 125°53'58 E; Fig. 1). The mangrove forest (Fig. 2) covers approximately 4,000 ha, which is about 55% of the total mangrove area in the SIPLAS (Department of Environment and Natural Resources 2015). Siargao has a Type II climate, characterized by no dry season and a pronounced maximum rainfall from December to February (PAGASA 2022). The island is home to many notable vertebrate species like Saltwater Crocodile (*Crocodylus porosus* Schneider, 1801), the threatened Philippine Tarsier (*Carlito syrichta* (Linnaeus, 1758)), and the critically endangered Philippine Cockatoo (*Cacatua haematurpygia* (Statius Müller, 1776)), and many other species of conservation interest. Of the 20 barangays (abbreviated brgy.) in the municipality of Del Carmen, 11 were chosen as our study sites due to their density of mangrove areas: Antipolo, Bitoon, Cabugao, Del Carmen, Domoyog, Esperanza, Lobogon, Mabuhay, Katipunan, San Fernando, and San Jose.

Methods

Prior to our fieldwork, we secured wildlife gratuitous permits from the Department of Environment and Natural Resources (WGP no. R13-2019-27, R13-2019-58, R13-2022-20). We conducted floristic surveys in the 11 sites from June 2019 to November 2022. We established five 10 × 10 m quadrat plots with a spacing of 400 m between each plot in a 2 km long transect to assess the floral diversity of all sampling sites; hence there was a total of 55 plots. Each plot comprised 10 × 10 m for trees (≥ 3 m), 5 × 5 m for shrubs, vines, ferns, and epiphytes, and 1 × 1 m for small herbs (Peet et al. 1998). Opportunistic sampling is also performed outside the plots. The collection of very tall trees (≥ 10 m), several widespread or introduced/alien species, was not made but are recorded as part of our observation. Data such as geographic coordinates for a GPS receiver, photographs, vernacular names (if any), habits, and densities were also noted. Each species' residency and conservation status based on the *IUCN Red List of Threatened Species* (IUCN 2023) were also noted.

Voucher specimens were designated with the field codes CBM19 XXXX and IAO22 XXXX, and they were deposited in the University of Santo Tomas Herbarium (USTH). We identified our collections using protologues, taxonomic keys, comparison of types, and online resources such as thephilippineplants.org (Pelsner et al. 2011 onwards) and Plants of the World Online (POWO 2022). Several publications by Primavera et al. (2004), Primavera and Dianala (2009), and Tomlinson (2016) were also consulted for identification.

We assessed the floral diversity of the sampling

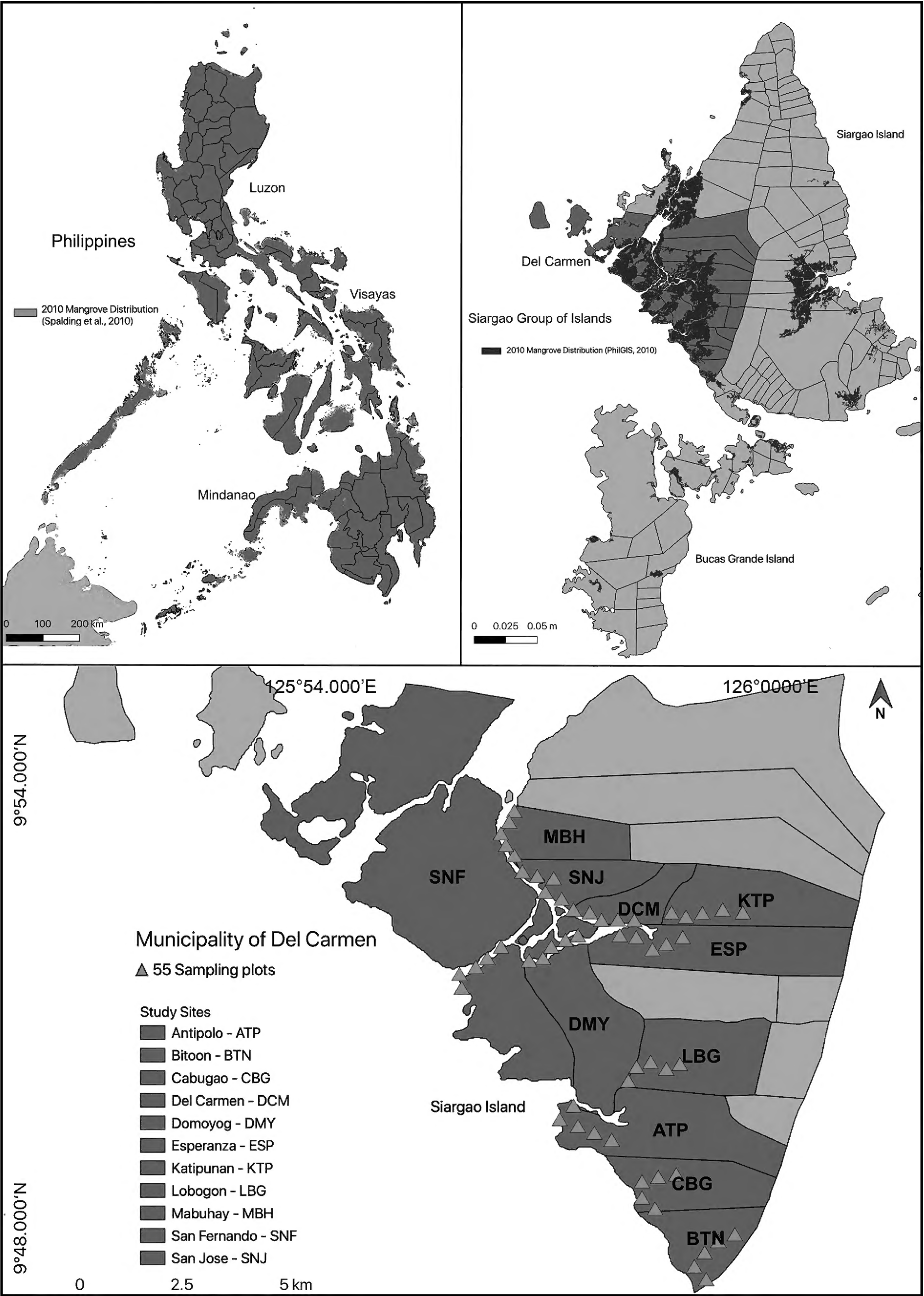


Figure 1. Map of Siargao Island. Sampling sites in the municipality of Del Carmen are indicated.

sites by computing the following diversity indices using the Paleontological Statistics software package (PAST4; Hammer et al. 2001): species richness (R),

Shannon-Weiner index (H'), effective number of species (ENS), Pielou's evenness (J'), and Simpson's index ($1-D$).

Results

Floristic composition and life forms. We report 166 species belonging to 143 genera in 73 families (Table 1). Of these, 20 are true mangroves (12.05%), and 146 (87.95%) are mangrove associates, beach forest, and terrestrial species. The most speciose families include Rubiaceae (14), Asteraceae (9), Fabaceae (9), Orchidaceae (8), Moraceae (7), and Poaceae (7), with all other families having six or fewer species. The floristic composition based on life forms consists 70 (42.17%) tree species, 39 (23.49%) herbs, 27 (16.26%) shrubs, 12 (7.23%) vines, 12 (7.23%) epiphytes, and six (3.61%) ferns. We provide short descriptions for rapid identification, local names when present, and comments for selected notable species we have observed in the area.

Residency, new records, and conservation status. Of the 166 species reported, 143 (86.14%) are native species (Figs. 3–6), of which 21 (12.65%) are endemic to the Philippines. The remaining 23 (13.86%) species are introduced species (Table 1). We also report 133 (83.13%) newly recorded species for Siargao Islands and 14 (8.43%) for Mindanao. Based on the IUCN (2023) Red List, three species (1.81%) are Near Threatened, two (1.20%) species are Vulnerable, and two (1.20%) species are Endangered (Table 1). Seventy species (42.17%)

are of Least Concern and 87 species (52.41%) have not been evaluated. Two (1.20%) species are Data Deficient (IUCN 2023).

Abundance and diversity analysis. We accounted for 1988 individuals within our established plots in the 11 barangays. The most abundant families are Rhizophoraceae (918 individuals), Rubiaceae (149), Acanthaceae (95), Primulaceae (54), and Fabaceae (43). The most abundant species are *Rhizophora mucronata* (544 individuals), *R. apiculata* (385), *Nypa fructicans* (85), *Myrmecodia tuberosa* (78), *Avicennia officinalis* (47), and *Myrsine mindanaensis* (34).

Our results reveal varying diversity across the 11 Del Carmen, Siargao Island barangays (Table 2). Barangay Del Carmen has consistently exhibited high degrees of diversity based on the computed indices ($R = 38$, $H' = 3.21$, $ENS = 25$, $J' = 0.88$, $1-D = 0.95$), followed by barangay Katipunan ($R = 31$, $H' = 3.02$, $ENS = 21$, $J' = 0.88$, $1-D = 0.94$). On the other hand, barangay Mabuhay ($R = 11$, $H' = 0.96$, $ENS = 3$, $J' = 0.39$, $1-D = 0.46$) and barangay Cabugao ($R = 10$, $H' = 1.04$, $ENS = 3$, $J' = 0.45$, $1-D = 0.57$) exhibited the lowest diversity values. Overall, the mangal areas of the municipality of Del Carmen exhibited a very high degree of diversity ($R = 113$, $H' = 3.16$, $ENS = 20$, $J' = 0.68$, $1-D = 0.88$).

Table 1. The mangal flora diversity of Del Carmen Forest, Siargao Island, Philippines arranged by family. Asterisk (*) = species newly recorded from Siargao Island; dagger (†) = newly recorded from the Mindanao region. Life form (Lf; T = tree, S = woody shrub, V = vine, H = herb, E = epiphyte), residency (R; End = endemic, Nat = native, Int = introduced), conservation status based on IUCN (NE = Not Evaluated, DD = Data Deficient, NT = Near Threatened, LC = Least Concern, VU = Vulnerable, EN = Endangered, CR = Critically Endangered), barangays where present in the Municipality of Del Carmen (ATP = Antipolo, BTN = Bitoon, CBG = Cabugao, DCM = Del Carmen, DMY = Domoyog, ESP = Esperanza, KTP = Katipunan, LBG = Lobogon, MBH = Mabuhay, SNF = San Fernando, SNJ = San Jose), and voucher numbers from USTH are provided. Species based on observation are indicated with a dash (–) in the vouchers column.

Taxa	Lf	R	IUCN	Areas Present	Vouchers
Acanthaceae					
<i>Acanthus ebracteatus</i> Vahl *	H	Nat	LC	ATP, ESP, SNJ	015880, 015897, 015901, 016104
<i>Acanthus volubilis</i> Wall. †	H	Nat	LC	ATP, SNJ	015898, 016062
<i>Avicennia officinalis</i> L.	T	Nat	LC	BTN, LBG, SNF	015801, 015866, 015986
Aizoaceae					
<i>Sesuvium portulacastrum</i> L.	H	Nat	NE	BTN	015830
Amaranthaceae					
<i>Amaranthus viridis</i> L.	H	Int	NE	ESP, DCM	–
Amarylloidaceae					
<i>Crinum asiaticum</i> L.	H	Nat	NE	DCM, KTP	–
Anacardiaceae					
<i>Buchanania arborescens</i> Blume	T	Nat	LC	SNF	015950
Annonaceae					
<i>Cananga odorata</i> (Lam.) Hok.f. & Thomson	T	Int	LC	KTP	–
<i>Dasymaschalon clusiflorum</i> (Merr.) Merr. *	S	Nat	LC	KTP	–
Apocynaceae					
<i>Dischidia platyphylla</i> Schltr.	V	End	NE	KTP	015706
<i>Hoya pubicalyx</i> Merr. †	V	End	NE	DCM, ESP, KTP	015926, 015692
Araceae					
<i>Amydrium medium</i> (Zoll. & Moritzi) Nicolson	E	Nat	NE	KTP	–
<i>Homalomena philippinensis</i> Engl. *	H	Nat	NE	KTP	–
Araliaceae					
<i>Heptapleurum ellipticum</i> (Blume) Seem.	S	Nat	LC	SNF	–
<i>Polyscias nodosa</i> (Blume) Seem. *	T	Nat	LC	KTP	–

Taxa	Lf	R	IUCN	Areas Present	Vouchers
Areceaceae					
<i>Cocos nucifera</i> L.	T	Nat	NE	ATP, DCM, DMY, KTP, SNF, SNJ	015725
<i>Nypa fruticans</i> Wurm	T	Nat	LC	ATP, DCM, ESP, KTP, LBG, MBH	015873, 015906, 015730
Asparagaceae					
<i>Dracaena angustifolia</i> Roxb.	S	Nat	NE	KTP, SNF	015708
Asteraceae					
<i>Ageratum conyzoides</i> L.	H	Int	LC	SNF	–
<i>Bidens pilosa</i> L.	H	Int	NE	ATP, DCM	–
<i>Blumea balsamifera</i> DC.	H	Nat	LC	KTP	–
<i>Chromolaena odorata</i> (L.) R.M. King & H.Rob.	H	Int	NE	ATP, DCM, KTP, SNF	–
<i>Cyanthillium cinereum</i> (L.) H.Rob.	H	Nat	NE	ATP, ESP, DCM	–
<i>Eclipta prostrata</i> *	H	Int	LC	ESP	–
<i>Mikania cordata</i> (Burm.f.) B.L. Rob.	V	Int	NE	KTP	–
<i>Sphagneticola trilobata</i> (L.) Pruski	H	Int	NE	ATP, DCM	–
<i>Wollastonia biflora</i> (L.) Pruski	H	Nat	NE	BTN, CBG, ESP, KTP, SNF	015820, 016101
Bignoniaceae					
<i>Radermachera gigantea</i> Miq.	T	Nat	LC	DCM	–
Brownlowiaceae					
<i>Diplodiscus paniculatus</i> Turcz.*	T	Nat	LC	SNF	–
Burseraceae					
<i>Canarium asperum</i> Benth.*	T	Nat	LC	KTP	–
Byttneriaceae					
<i>Commersonia bartramia</i> (L.) Merr.	T	Nat	LC	KTP	–
<i>Melochia umbellata</i> (Houtt.) Stapf	T	Nat	LC	DCM	–
Calophyllaceae					
<i>Calophyllum blancoi</i> Planch. & Triana	T	Nat	NE	DCM	–
<i>Calophyllum inophyllum</i> L.	T	Nat	LC	BTN	015809
<i>Kayea navesii</i> (Fern.-Vill.) Vesque *	S	End	NE	DCM	016108
Campanulaceae					
<i>Hippobroma longiflora</i> (L.) G. Don	H	Int	NE	KTP	–
Caricaceae					
<i>Carica papaya</i> L.	H	Int	DD	ATP	–
Cleomaceae					
<i>Sieruela rutidosperma</i> (DC.) Roalson & J.C. Hall	H	Int	NE	ESP	–
Combretaceae					
<i>Lumnitzera littorea</i> (Jack) Voigt	T	Nat	LC	SNF	016005
<i>Terminalia catappa</i> L.	T	Nat	LC	ATP, DCM, KTP, SNF	–
Connaraceae					
<i>Cnestis palala</i> (Lour.) Merr. †	V	Nat	NE	DCM	016115
Convolvulaceae					
<i>Ipomoea batatas</i> (L.) Lam.	V	Int	DD	ATP, DCM	–
Cordiaceae					
<i>Cordia subcordata</i> Lam. *	T	Nat	LC	MBH	016073
Costaceae					
<i>Hellenia speciosa</i> (J. Koenig) Govaerts *	H	Nat	LC	KTP	–
Cucurbitaceae					
<i>Melothria pendula</i> L.	V	Int	NE	ESP	–
Cycadaceae					
<i>Cycas edentata</i> de Laub.	T	Nat	NT	SNJ	016039
Cyperaceae					
<i>Cyperus rotundus</i> L. *	H	Nat	LC	ATP, DCM, KTP	016114
<i>Scleria scrobiculata</i> Nees & Meyen in Wight	H	Nat	NE	DCM, DMY, KTP	–
Ebenaceae					
<i>Diospyros ferrea</i> (Willd.) Bakh.	T	Nat	NE	ESP, KTP, SNJ	015695, 015907, 016053
Euphorbiaceae					
<i>Acalypha amentacea</i> Roxb. *	S	Nat	NE	ATP, BTN, DCM, LBG	015849
<i>Euphorbia hirta</i> L.	H	Int	NE	ATP, DCM	–
<i>Excoecaria agallocha</i> L.	T	Nat	LC	CBG, SNF, SNJ	016002. 016019, 016097
<i>Macaranga tanarius</i> (L.) Müll. Arg.	T	Nat	LC	ATP, DCM, KTP, SNF	–

Taxa	Lf	R	IUCN	Areas Present	Vouchers
Fabaceae					
<i>Abrus precatorius</i> L.	V	Nat	NE	DCM	015783
<i>Alysicarpus vaginalis</i> (L.) DC.	H	Nat	NE	ATP, DCM	–
<i>Dalbergia pinnata</i> (Lour.) Prain	S	Nat	LC	KTP	–
<i>Dendrolobium umbellatum</i> (L.) Benth *	S	Nat	LC	DMY, SNF	015674
<i>Derris trifoliata</i> Lour.	V	Nat	NE	ATP, ESP, SNF, SNJ	015882, 015911, 016015, 016048
<i>Leucaena leucocephala</i> (Lam.) de Wit	T	Int	NE	ATP, BTN, CBG, DCM	016099
<i>Millettia pinnata</i> (L.) Panigrahi	T	Nat	LC	BTN	015826
<i>Mimosa pudica</i> L.	H	Int	LC	ATP, DCM, DMY	015672
<i>Pterocarpus indicus</i> Willd.	T	Nat	EN	KTP, SNF	–
Flagellariaceae					
<i>Flagellaria indica</i> L.	V	Nat	NE	ESP, KTP	–
Gentianaceae					
<i>Utania volubilis</i> (Wall.) M. Sugumaran	T	Nat	NE	DMY, KTP, SNF	015732, 015673
Gnetaceae					
<i>Gnetum gnemon</i> L.	T	Nat	NE	KTP	–
Goodeniaceae					
<i>Scaevola taccada</i> (Gaertn) Roxb.	S	Nat	NE	KTP	–
Lamiaceae					
<i>Premna serratifolia</i> L.	T	Nat	LC	BTN	015816
<i>Volkameria inermis</i> L.	S	Nat	NE	DCM	–
Lauraceae					
<i>Neolitsea villosa</i> (Blume) Merr. *	T	Nat	LC	KTP	–
Loranthaceae					
<i>Amyema beccarii</i> (Tiegh.) Danser *	E	Nat	NE	DCM, KTP	–
<i>Decaisnina cumingii</i> (Tiegh.) Barlow	S	Nat	NE	KTP	015700
Lygodiaceae					
<i>Lygodium circinnatum</i> (Burm.f.) Sw.	F	Nat	NE	DMY	015676
Lythraceae					
<i>Pemphis acidula</i> J.R. Forst. & G. Forst.	S	Nat	LC	MBH, SNF	016070, 015990
<i>Sonneratia alba</i> Sm.	T	Nat	LC	SNF	015998
<i>Sonneratia caseolaris</i> (L.) Engl.	T	Nat	LC	BTN, ESP	015828
Malpighiaceae					
<i>Tristellateia australasiae</i> A.Rich.*	V	Nat	NE	KTP	–
Malvaceae					
<i>Camptostemon philippinensis</i> (S.Vidal) Becc.	T	Nat	EN	SNF	017581
<i>Sida rhombifolia</i> L.	S	Nat	NE	DCM	–
Melastomataceae					
<i>Medinilla quadrifolia</i> Blume *	S	Nat	NE	DCM	015768
<i>Medinilla teysmannii</i> Miq. *	S	Nat	NE	ATP, DCM, KTP	015753, 015893
<i>Melastoma malabathricum</i> L.	S	Nat	NE	KTP	–
<i>Memecylon ovatum</i> Sm.	T	Nat	LC	KTP	–
Meliaceae					
<i>Xylocarpus granatum</i> J. Koenig	T	Nat	LC	ATP, DCM, ESP, LBG, MBH, SNJ	015751; 015884; 015925; 016076
Moraceae					
<i>Artocarpus blancoi</i> (Elmer) Merr. *	T	End	LC	KTP	015714
<i>Artocarpus multifidus</i> F.M.Jarrett *	T	End	NE	KTP	–
<i>Artocarpus ovatus</i> Blanco *	T	End	NE	KTP	–
<i>Ficus nota</i> (Blanco) Merr. †	T	Nat	LC	KTP	–
<i>Ficus pedunculosa</i> Miq.	T	Nat	NE	CBG, KTP	016103
<i>Ficus pseudopalma</i> Blanco *	T	Nat	NE	ESP, KTP, SNF	–
<i>Ficus septica</i> Burm. f.†	T	Nat	LC	KTP, SNF	–
Muntingiaceae					
<i>Muntingia calabura</i> L.	T	Int	LC	ATP, DCM	–
Myrtaceae					
<i>Decaspermum parviflorum</i> (Lam.) A.J. Scott	T	Nat	LC	DCM, KTP	–
<i>Syzygium alcinae</i> (Merr.) Merr. & L.M.Perry	T	Nat	NE	KTP	–
<i>Syzygium confertum</i> (Korth.) Merr. & L. Perry †	T	Nat	NE	ESP, SNF	–
Nepenthaceae					
<i>Nepenthes abgracilis</i> Jebb & Cheek *	V	End	NE	KTP	015699

Taxa	Lf	R	IUCN	Areas Present	Vouchers
Oleaceae					
<i>Chionanthus ramiflorus</i> Roxb.	T	Nat	NE	KTP	–
Orchidaceae					
<i>Arachnis flos-aeris</i> (L.) Rchb. f. *	E	Nat	NE	DCM	–
<i>Bulbophyllum apodum</i> Hook. f. *	E	Nat	NE	DCM	–
<i>Dendrobium dearei</i> Rchb. f.	E	End	NE	DCM	015747
<i>Dendrobium escritorii</i> Ames *	E	End	NE	KTP	–
<i>Dendrobium lunatum</i> Lindl. †	E	End	NE	DCM, KTP	015749
<i>Dendrobium merrillii</i> Ames †	E	End	LC	KTP	–
<i>Dendrobium secundum</i> (Blume) Lindl. ex Wall. *	E	End	NE	DCM	015722
<i>Renanthera storiei</i> Rchb. f.	E	End	NE	KTP	–
Pandanaceae					
<i>Benstonea affinis</i> (Kurz) Callm. & Buerki †	T	Nat	NE	BTN, DMY, SNF	015684, 015839, 015972
<i>Benstonea copelandii</i> (Merr.) Callm. & Buerki *	T	End	LC	KTP	–
<i>Pandanus tectorius</i> Parkinson ex Du Roi †	T	Nat	LC	SNJ	016044
<i>Sararanga philippinensis</i> Merr.	T	End	NT	KTP	–
Passifloraceae					
<i>Passiflora foetida</i> L.	V	Int	NE	ATP, DCM	–
Phyllanthaceae					
<i>Glochidion album</i> (Blanco) Boerl.	S	Nat	NE	KTP	–
<i>Glochidion littorale</i> Blume*	S	Nat	LC	DCM, ESP	015741, 015913
<i>Glochidion woodii</i> Merr.*	S	End	NE	BTN, DCM	015847, 015743
<i>Moeroris amara</i> (Schumach. & Thonn.) R.W.Bouman	H	Int	NE	ESP, KTP	–
Plantaginaceae					
<i>Scoparia dulcis</i> L.	H	Int	NE	ATP, DCM	–
Poaceae					
<i>Chloris barbata</i> Sw.	H	Nat	NE	ATP, DCM	–
<i>Cynodon dactylon</i> (L.) Pers.	H	Nat	NE	ATP, DCM	–
<i>Digitaria setigera</i> Roth	H	Nat	NE	ATP, DCM	–
<i>Dinochloa luconiae</i> (Munro) Merr.	H	Nat	NE	KTP	016113
<i>Eleusine indica</i> (L.) Gaertn.	H	Int	LC	ATP, ESP, DCM	–
<i>Imperata cylindrica</i> (L.) P.Beauv.	H	Nat	LC	BTN, DCM, DMY	015787, 015682
<i>Saccharum spontaneum</i> L.	H	Nat	LC	ATP, DCM	–
Polypodiaceae					
<i>Agalomorpha quercifolia</i> (L.) Hovenkamp & S.Linds	F	Nat	NE	DCM	–
<i>Pyrrosia lanceolata</i> (L.) Farw.	F	Nat	NE	DCM	–
Portulacaceae					
<i>Portulaca oleracea</i> L.	H	Nat	LC	ESP	–
Primulaceae					
<i>Ardisia elliptica</i> Thunb.	T	Nat	VU	BTN, DCM, KTP	015842, 015754
<i>Aegiceras floridum</i> Roem. & Schult.	S	Nat	NT	SNF	015953
<i>Myrsine mindanaensis</i> (Elmer) Pipoly*	S	End	NE	DCM, ESP, KTP, SNF	015764, 015928, 015703, 015942
Pteridaceae					
<i>Acrostichum aureum</i> L.*	F	Nat	LC	ESP, DCM	015704
<i>Acrostichum speciosum</i> Willd.*	F	Nat	LC	ESP, KTP	015900, 015721
Rhamnaceae					
<i>Alphitonia excelsa</i> (Fenzl) Reissek ex Endl.*	T	Nat	LC	KTP	–
Rhizophoraceae					
<i>Bruguiera gymnorhiza</i> (L.) Lam.	T	Nat	LC	ATP, BTN, CBG, DMY,ESP, KTP, LBG, MBH SNF, SNJ	015806, 015914, 016085,015716, 015687, 015852, 016075,015956, 016028
<i>Ceriops tagal</i> (Perr.) C.B.Rob.	T	Nat	LC	ATP, DCM, SNF	015885
<i>Rhizophora apiculata</i> Blume	T	Nat	LC	ATP, BTN, CBG, DCM, DMY, ESP, KTP, LBG, MBH, SNF, SNJ	015887, 015788, 016088,015689, 015903, 015696, 015867,016004, 016022
<i>Rhizophora mucronata</i> Lam.	T	Nat	LC	ATP, BTN, CBG, DCM, DMY, ESP, KTP, LBG, MBH, SNF, SNJ	015883, 015795, 016089,015685, 015921, 015851, 01585, 016030
Rubiaceae					
<i>Gardenia mutabilis</i> Reinw. ex Blume*	T	Nat	NE	KTP	–

Taxa	Lf	R	IUCN	Areas Present	Vouchers
<i>Guettarda speciosa</i> L.*	T	Nat	LC	DCM, MBH, SNJ	015733, 016026, 016071
<i>Hedyotis pruinosa</i> Wight & Arn.†	T	Nat	NE	ESP	–
<i>Hydnophytum formicarum</i> Jack*	E	Nat	NE	KTP, LBG	015720
<i>Ixora macrophylla</i> Bartl. ex DC.	S	End	NE	DCM, KTP	015709
<i>Morinda citrifolia</i> L.	T	Nat	NE	SNF	–
<i>Mussaenda philippica</i> A.Rich.*	T	Nat	LC	ATP, DCM, KTP	–
<i>Myrmecodia tuberosa</i> Jack*	E	Nat	NE	ATP, CBG, DCM, ESP, KTP, LBG, SNF	015705
<i>Neonauclea calycina</i> (Bartl. ex DC.) Merr.*	T	Nat	LC	KTP	–
<i>Neonauclea formicaria</i> (Elmer) Merr.*	T	End	LC	KTP, SNJ	016066
<i>Psychotria gitingensis</i> Elmer	T	End	LC	DCM, KTP	017171
<i>Scyphiphora hydrophylacea</i> C.F.Gaertn.	S	Nat	LC	BTN, DCM, MBH, SNF, SNJ	015800, 016080, 015962, 016027
<i>Spermacoce ocymoides</i> Burm.f.†	H	Nat	NE	ATP	–
<i>Timonius finlaysonianus</i> (Wall. ex G.Don) Hook.f.*	S	Nat	NE	BTN, DCM, ESP, KTP, SNF, SNJ	015833, 015735, 015697, 016023
Rutaceae					
<i>Melicope frutescens</i> (Blanco) Appelhans & J.Wen*	T	Nat	NE	KTP	–
<i>Murraya paniculata</i> (L.) Jack	S	Nat	NE	KTP	–
Salicaceae					
<i>Allophylus cobbe</i> (L.) Raeusch.	T	Nat	LC	BTN, CBG, ESP	015823, 016098, 015932
<i>Casearia fuliginosa</i> (Blanco) Blanco*	T	Nat	NE	SNJ	016065
<i>Casearia grewiifolia</i> Vent.	T	Nat	LC	ATP, KTP	–
<i>Guioa diplopetala</i> (Hassk.) Radlk*	T	Nat	LC	KTP, SNF	015702, 015969
<i>Scolopia luzonensis</i> Warb.*	S	Nat	LC	KTP, MBH	015711, 016078
Selaginellaceae					
<i>Selaginella delicatula</i> (Desv. ex Poir.) Alston	F	Nat	NE	DCM	–
Solanaceae					
<i>Capsicum annuum</i> L.	H	Int	LC	KTP	–
Sterculiaceae					
<i>Heritiera littoralis</i> Aiton	T	Nat	LC	ESP, KTP, SNF, SNJ	016055
<i>Sterculia ceramica</i> R.Br.*	T	Nat	NE	DCM, SNF, SNJ	015755, 016057
Taccaceae					
<i>Tacca palmata</i> Blume	H	Nat	NE	SNF	–
Thymelaeaceae					
<i>Wikstroemia indica</i> (L.) C.A. Mey*	S	Nat	NE	DCM, KTP, SNF, SNJ	015744, 015718, 015944, 016059
Urticaceae					
<i>Pipturus arborescens</i> (Link) C.B.Rob.	T	Nat	NE	DCM	–
Verbenaceae					
<i>Phyla nodiflora</i> (L.) Greene	H	Nat	LC	ATP, DCM	–
<i>Stachytarpheta jamaicensis</i> (L.) Vahl	H	Int	LC	ATP, BTN, DCM, SNF	015844, 015786
Vitaceae					
<i>Leea manillensis</i> Walp.	S	Nat	NE	KTP	–
Zingiberaceae					
<i>Alpinia elegans</i> (C.Presl) K.Schum.†	H	End	VU	KTP, SNF	–

Annotated species list of the mangal flora in Del Carmen, Siargao

Family Acanthaceae

Acanthus ebracteatus subsp. *ebracteatus* Vahl

Figure 3A

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 23.VII.2019; C. Moran, J. Ordas, and N. Moran leg.; CBM19 051; USTH 015880.

Identification. Erect spreading herbs up to 0.5–1.0 m tall. Leaves opposite-decussate, dimorphic, most blades deeply lobed and serrated margins with sharp spines,

some elliptical with entire margins, coriaceous, 10–15 × 4–5 cm. Flowers in terminal spikes, white, 2–3 cm. Fruits slightly flattened capsules, dark green, 2 cm.

Locally known as “lagiwliw” or “ragoyroy”, this species is widespread across Southeast Asia and is present in several islands in the Philippines. However, this is the first time this species has been recorded on Siargao Island. This species is dominant in the undergrowth of mangrove areas in Del Carmen. Locals reported that the species is used as medication for coughing.

Acanthus volubilis Wall.

Figure 3B

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen,

Table 2. Diversity analyses of the 11 barangays of the municipality of Del Carmen, Siargao Island. The diversity indices include (*R* = species richness, *H'* = Shannon-Weiner index, ENS = effective number of species, *J'* = Pielou’s evenness, and 1–*D* = Simpson’s index).

Site	R	<i>H'</i>	ENS	<i>J'</i>	1– <i>D</i>
Bitoon	21	1.962	7	0.64	0.76
Lobogon	6	1.237	3	0.69	0.65
Antipolo	12	1.278	4	0.51	0.59
Esperanza	18	2.035	8	0.70	0.81
Katipunan	31	3.022	21	0.88	0.94
San Fernando	24	1.740	6	0.54	0.61
Del Carmen	38	3.211	25	0.88	0.95
San Jose	23	2.304	10	0.73	0.84
Mabuhay	11	0.958	3	0.39	0.46
Domoyog	15	2.136	8	0.78	0.82
Cabugao	10	1.044	3	0.45	0.57
Overall	113	3.160	20	0.68	0.88



Figure 2. Landscape images of the mangal areas on Siargao Island. **A.** Nipa estuary in Brgy. Lobogon. **B.** Mudflats in Brgy. San Fernando. **C.** Mangrove forest in Brgy. Del Carmen. **D.** Aerial view of the mangal area on Siargao Island.

Brgy. Antipolo; 09°48'45"N, 125°59'24"E; 25.VII.2019; C. Moran, J. Ordas, N. Moran, and G. Cortez leg.; CBM19 321; USTH 015898.

Identification. Erect spreading herbs up to 0.5–1.0 m tall. Leaves opposite-decussate, elliptical, margins entire but some with spines, coriaceous, 15–20 × 4–5 cm. Flowers in terminal spikes, white, 2–3 cm. Fruits slightly flattened capsules, dark green, 2 cm.

Similar to *A. ebracteatus*, this species also has a wide distribution across Southeast Asia and some islands in the Philippines. This is the first time this species has been recorded in the Mindanao region, unlike *A. bracteatus*. It also grows sympatrically with *A. ebracteatus* as an undergrowth flora of mangrove areas.

Avicennia officinalis L.

Figure 3C

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Bitoon; 09°46'46"N, 126°00'20"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio leg.; CBM19 008; USTH 015801.

Identification. Small to medium-sized trees up to 3–5 m tall. Leaves opposite, margins entire, coriaceous, elliptical, 4–6 × 2.0–3.5 cm. Flowers in terminal heads, bright yellow. Fruits capsules with acute tips, green to greyish brown, 2.0–2.5 cm in diameter.

Locally known as “bungalon” or “piapi”, this species has a wide distribution across Southeast Asia and the

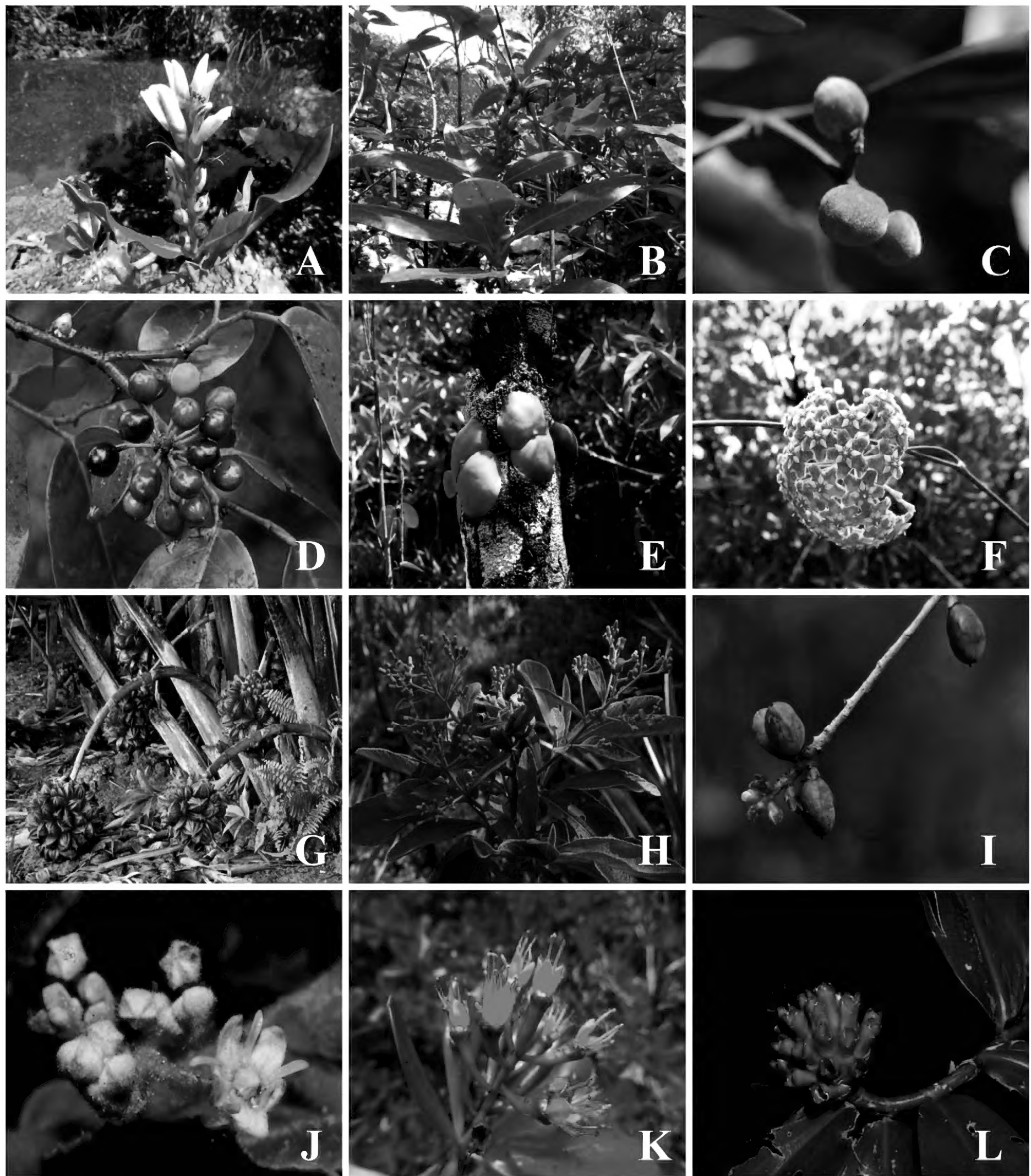


Figure 3. Native and endemic species of Del Carmen, Siargao. **A.** *Acanthus ebracteatus* subsp. *ebracteatus*. **B.** *Acanthus volubilis*. **C.** *Avicennia officinalis*. **D.** *Dasymaschalon clusiflorum*. **E.** *Dischidia platyphylla*. **F.** *Hoya pubicalyx*. **G.** *Nypa fruticans*. **H.** *Blumea balsamifera*. **I.** *Canarium asperum*. **J.** *Commersonia bartramia*. **K.** *Lumnitzera littorea*. **L.** *Hellenia speciosa*.

Philippines. In Del Carmen, it thrives on mudflats and sandy coasts, but only a few individuals were observed, as they are usually found within thick *Rhizophora* L. stands or behind them.

Family Aizoaceae

***Sesuvium portulacastrum* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy.

Bitoon; 09°47'06"N, 126°00'26"E; 21.VII.2019; C. Moran, J. Ordas, S. Zamudio leg.; CBM19 022; USTH 015830.

Family Amaranthaceae

***Amaranthus viridis* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; 09°51'57"N, 126°00'36"E; 29.XI.2019; D. Tandang obs.; CBM19 502.

Family Amaryllidaceae

***Crinum asiaticum* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°55'11"N, 126°02'11"E; 29.XI.2019; D. Tandang obs.; CBM19 606.

Family Anacardiaceae

***Buchanania arborescens* Blume**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Fernando; 09°49'13"N, 125°58'32"E; 24.VII.2019; C. Moran, J. Ordas, N. Moran, and G. Cortez leg.; CBM19 098; USTH 015950.

Family Annonaceae

***Cananga odorata* (Lam.) Hook. f. & Thomson**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 519.

***Dasymaschalon clusiflorum* (Merr.) Merr.**

Figure 3D

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 520.

Family Apocynaceae

***Dischidia platyphylla* Schltr. (Fig. 3E)**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'37"N, 126°00'32"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 167; USTH 015706.

Identification. Epiphytic vine with a stem that can reach several meters long. Leaves opposite, fleshy with white sap, terminal leaves flattened, ovate, 2–4 cm, basal leaves attached to trunk kidney-shaped, 3–5 cm, dark to light green on upper surfaces, maroon below. Flowers and fruits not seen.

Dischidia platyphylla is endemic to the Philippines and has been recorded in several islands. This species is quite common on trees, especially coconut trees, and sometimes on dead tree trunks in mangrove areas. It harbors ant species within its modified, shell-like leaves.

***Hoya pubicalyx* Merr.**

Figure 3F

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; 09°51'55"N, 125°59'46"E; 23.VII.2019; C. Moran, J. Ordas, and N. Moran leg.; CBM19 085; USTH 015926.

Identification. Epiphytic vine with a stem that can reach several meters long. Leaves opposite, fleshy with white sap, oblong to oblong-obovate, 10–15 mm. Flowers in numerous umbels of 9 cm in diameter, fragrant, pubescent, pink to dark red corollas. Fruits not seen.

This endemic *Hoya* R. Br. species has only been recorded in the province of Quezon on the mega island of Luzon. Thus, our record presents a range expansion of this species and new records for Siargao and the Mindanao region flora. This epiphyte occurs as epiphytes on mangrove trees in Brgy. Katipunan.

Family Araceae

***Amydrium medium* (Zoll. & Moritz) Nicolson**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs. CBM19 521.

***Homalomena philippinensis* Engl.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 522.

Family Araliaceae

***Heptapleurum ellipticum* (Blume) Seem.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Fernando; 09°49'13"N, 125°58'32"E; 28.XI.2019; D. Tandang obs.; CBM19 584.

***Polyscias nodosa* (Blume) Seem.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XII.2019; D. Tandang obs.; CBM19 533.

Family Arecaceae

***Cocos nucifera* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'32"N, 126°00'31"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 198; USTH 015725.

***Nypa fruticans* Wurmb.**

Figure 3G

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Lobogon; 09°50'28"N, 126°00'49"E; 22.VII.2019; C. Moran, J. Ordas, S. Zamudio, and N. Moran leg.; CBM19 049; USTH 015873.

Identification. Medium-sized palms up to 8 m tall. Leaves compound, pinnate, leaflets in 10–20 per leaf, 50–100 × 5–7 cm. Flowers in axillary catkins, orange to yellow. Fruits in globose clusters, brown, 20–30 cm in diameter.

Known locally as “Nipa”, this species is one of the most abundant mangrove species in Del Carmen, Siargao. It forms numerous monotypic zonation, particularly in shallow and estuarine areas. The leaves are used as material for house furniture by the locals, whereas the fruit is harvested to be used as wine and vinegar.

Family Asparagaceae

***Dracaena angustifolia* Roxb.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'37"N, 126°00'32"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 169; USTH 015708.

Family Asteraceae

***Ageratum conyzoides* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Fernando; 09°49'13"N, 125°58'32"E; 28.XI.2019; D. Tandang obs.; CBM19 587.

***Bidens pilosa* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 473.

***Blumea balsamifera* DC.**

Figure 3H

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 534.

***Chromolaena odorata* (L.) R.M. King & H. Rob.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 474.

***Cyanthillium cinereum* (L.) H. Rob.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 475.

***Eclipta prostrata* (L.) L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; 09°51'57"N, 126°00'36"E; 27.XI.2019; D. Tandang obs.; CBM19 504.

***Mikania cordata* (Burm. f.) B. L. Rob.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 536.

***Sphagneticola trilobata* (L.) Pruski**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 476.

***Wollastonia biflora* (L.) Pruski**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Bitoon; 09°47'06"N, 126°00'26"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio leg.; CBM19 018; USTH 015820.

Family Bignoniaceae

***Radermachera gigantea* Miq.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°55'11"N, 126°02'11"E; 29.XI.2019; D. Tandang obs.; CBM19 640.

Family Brownlowiaceae

***Diplodiscus paniculatus* Turcz.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Fernando; 09°49'13"N, 125°58'32"E; 28.XI.2019; D. Tandang obs.; CBM19 591.

Family Burseraceae

***Canarium asperum* Benth. (Fig. 3I)**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs. CBM19 538.

Identification. Medium-sized to tall trees reaching 10 m or more. Leaves compound with 4–7 leaflets, margins entire, leathery with prominent venations beneath, oval to elliptical, 10.5–12.0 × 4.0–4.5 cm. Flowers not seen. Fruits hard drupe, olive green, oblong, 10–12 mm.

This species is widely distributed across the Philippines and is also found in Indonesia and New Guinea. It is observed occurring in the mangal areas and thickets of Brgy. Katipunan behind dense *Rhizophora* stands. This is a new record for Siargao Island.

Family Byttneriaceae

***Commersonia bartramia* (L.) Merr.**

Figure 3J

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 539.

***Melochia umbellata* (Houtt.) Stapf**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°55'11"N, 126°02'11"E; 29.XI.2019; D. Tandang obs.; CBM19 641.

Family Calophyllaceae

***Calophyllum blancoi* Planch. & Triana**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'33"N, 126°01'16"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez obs.; CBM19 216.

***Calophyllum inophyllum* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Bitoon; 09°46'47"N, 126°00'20"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio leg.; CBM19 012; USTH 015809.

Identification. Medium-sized to tall trees reaching 5–10 m or more. Leaves opposite, margins entire, smooth leathery, ovate to obovate-oblong, 10–20 × 7–11 cm. Flowers in axillary racemes, white with numerous yellow stamens, 23–28 mm. Fruits drupe, greenish, ovoid to subglobose, 26–35 × 7–11 cm.

Known by the locals as “bitaog”, this beach forest species has a broad global distribution in northern Australia and extends towards Southeast Asia and India. It is commonly planted on shorelines and beach fronts due to its capacity to withstand strong winds.

***Kayea navesii* (Fern.-Vill.) Vesque**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°57'04"N, 126°01'49"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 240; USTH 016108.

Family Campanulaceae

***Hippobroma longiflora* (L.) G. Don**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 540.

Family Caricaceae

***Carica papaya* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 477.

Family Cleomaceae

***Sieruela rutidosperma* (DC.) Roalson & J.C. Hall**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; 09°51'57"N, 126°00'36"E; 27.XI.2019; D. Tandang obs.; CBM19 506.

Family Combretaceae

***Lumnitzera littorea* (Jack) Voigt**

Figure 3K

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Fernando; 09°49'03"N, 125°58'21"E; 24.VII.2019; C. Moran, J. Ordas, and G. Cortez leg.; CBM19 128; USTH 016005.

Identification. Medium-sized trees up to 5 m tall, with pneumatophores. Leaves alternate, margins entire, coriaceous, light green, obovate, 3–6 × 1–2 cm. Flowers in numerous clusters, fragrant, bright red, 1–3 cm long. Fruits one-seeded pseudocarp, light green to green, slightly reddish at the center, oblong-ellipsoidal, 1–2 cm.

Known locally as “kulasi”, this species is native to Southeast Asia, extending towards the Pacific. Few individuals are encountered on the shores of Brgy. San Fernando.

***Terminalia catappa* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 23.VII.2019; C. Moran, J. Ordas, and N. Moran obs.; CBM19 053.

Identification. Tall trees up to 20 m or more. Leaves whorled, obovate, margins entire, apex rounded to bluntly pointed, 10–20 × 6–12 cm. Flowers in axillary spikes, 8–10 cm long. Fruits are clustered and almond-shaped, green to dark green, 5–7 cm.

Known by the locals as “talisyay”, this beach forest species is prominent in the Philippines. This beach forest species, like certain *Calophyllum* L. species are known to withstand strong winds.

Family Connaraceae

***Cnestis palala* (Lour.) Merr.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°57'04"N, 126°01'49"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 239; USTH 016115.

Family Convolvulaceae

***Ipomoea batatas* (L.) Lam.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 478.

Family Cordiaceae

***Cordia subcordata* Lam.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Mabuhay; 09°54'23"N, 125°58'30"E; 25.VII.2019; C. Moran, J. Ordas, N. Moran, and G. Cortez leg.; CBM19 336; USTH 016073.

Family Costaceae

***Hellenia speciosa* (J. Koenig) Govaerts**

Figure 3L

Materials examined. PHILIPPINES – **Surigao del**

Norte • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 542.

Family Cucurbitaceae

***Melothria pendula* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; 09°51'57"N, 126°00'36"E; 27.XI.2019; D. Tandang obs.; CBM19 507.

Family Cycadaceae

***Cycas edentata* de Laub.**

Figure 4A

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Jose; 09°52'44"N, 125°57'25"E; 25.VII.2019; C. Moran, J. Ordas, N. Moran, and G. Cortez leg.; CBM19 317; USTH 016039.

Identification. Medium-sized, unbranched female tree up to 5 m tall. Leaves pinnately compound, 2–5 m long, leaflets up to 60–100 pairs. Female cone in center of plant, ovules borne in megasporophylls. Ovules ovoid, greenish, 5–6 cm.

Known locally as “pitogo” this cycad occurs widely across Southeast Asia and in several Philippine islands. However, IUCN (2023) classified this species as Near Threatened, with decreasing populations due to increased agriculture and commercial development. This cycad was encountered in Brgy. San Jose, in coastal vegetation behind mangrove areas. All our observations are of female individuals.

Family Cyperaceae

***Cyperus rotundus* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'32"N, 126°00'31"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 187; USTH 016114.

***Scleria scrobiculata* Nees & Meyen in Wight**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 543.

Family Ebenaceae

***Diospyros ferrea* (Willd.) Bakh.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'32"N, 126°00'31"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 180; USTH 015695.

Identification. Medium-sized trees up to 10–12 m tall. Leaves alternate, margins entire, leathery, obovate, 2–4 × 1–2 cm. Flowers not seen. Fruits berries, orange

turning red to black upon maturity, globose with persistent calyx, 1 cm.

A native species in Southeast Asia that is known as “sea ebony” or “bantolinao” found in the coastal forest of Brgy Del Carmen and Brgy Katipunan. It is easily recognized in the field by its black bark which differs from other trees in the area. The wood is known for construction and furniture making.

Family Euphorbiaceae

***Acalypha amentacea* Roxb.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Bitoon; 09°47'09"N, 126°00'28"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio leg.; CBM19 032; USTH 015849.

***Euphorbia hirta* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 481.

***Excoecaria agallocha* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Fernando; 09°49'13"N, 125°58'23"E; 24.VII.2019; C. Moran, J. Ordas, N. Moran, and G. Cortez leg.; CBM19 124; USTH 016002.

Identification. Tall trees up to 10 m or more. Leaves alternate-spiral, margins crenate, somewhat thick, elliptical to lanceolate, 4.5–10.0 × 2–5 cm. Flowers not seen. Fruits capsules, leathery brown, globose to subglobose, 0.7 cm.

Known by the locals as “buta buta”, this true mangrove species is widely distributed in tropical Africa and Asia to Oceania. It does not form stands as observed in Siargao and thrives in sandy estuaries and beach areas. This is easily recognized in the field due to its catkin inflorescences. Its sap is poisonous and causes skin irritation upon contact.

***Macaranga tanarius* (L.) Müll. Arg.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 482.

Family Fabaceae

***Abrus precatorius* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'30"N, 126°01'23"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 258; USTH 015783.

***Alysicarpus vaginalis* (L.) DC.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen,

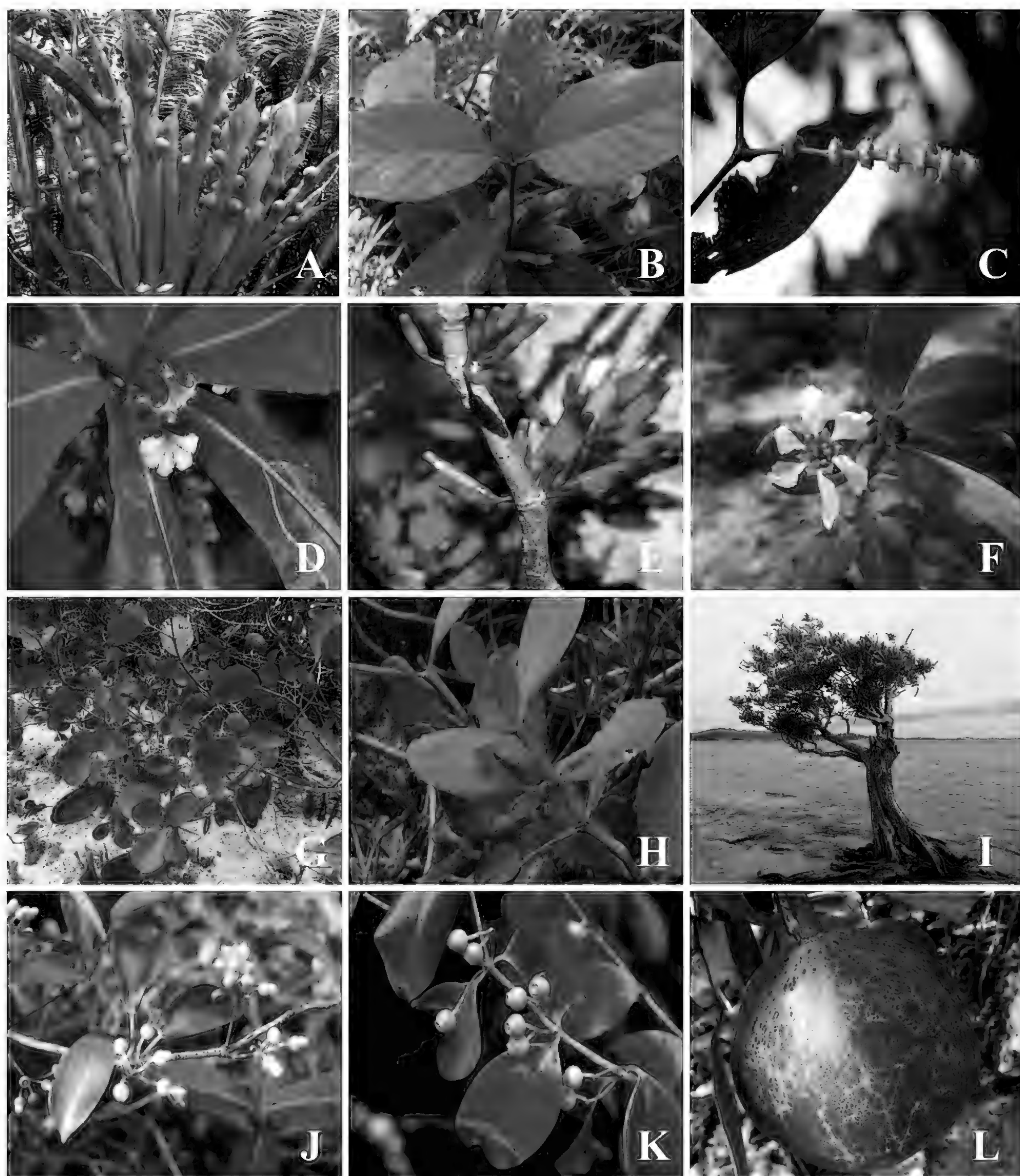


Figure 4. Native and endemic species of Del Carmen, Siargao. **A.** *Cycas edentata*. **B.** *Utania volubilis*. **C.** *Gnetum gnemon*. **D.** *Scaevola taccada*. **E.** *Amyema beccarii*. **F.** *Pemphis acidula*. **G.** *Sonneratia alba*. **H.** *Sonneratia caseolaris*. **I.** *Camptostemon philippinensis*. **J.** *Medinilla quadrifolia*. **K.** *Memecylon ovatum*. **L.** *Xylocarpus granatum*.

Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 483.

***Dalbergia pinnata* (Lour.) Prain**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 549.

***Dendrolobium umbellatum* (L.) Benth**

Materials examined. PHILIPPINES – Surigao del

Norte • Siargao Island, Municipality of Del Carmen, Brgy. San Fernando; 10°01'43"N, 126°14'03"E; 25.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM 19 268; USTH 015674.

***Derris trifoliata* Lour.**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 23.VII.2019; C. Moran, J. Ordas, and N. Moran leg.; CBM19 052; USTH 015882.

***Leucaena leucocephala* (Lam.) de Wit**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Cabugao; 09°54'33"N, 125°59'07"E; 26.VIII.2019; G. Cortez leg.; CBM19 411; USTH 016099.

***Millettia pinnata* (L.) Panigrahi**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Bitoon; 09°47'06"N, 126°00'26"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio leg.; CBM19 020; USTH 015826.

***Mimosa pudica* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Domoyog; 10°01'43"N, 126°14'03"E; 25.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 265; USTH 015672.

***Pterocarpus indicus* Willd.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 550.

Family Flagellariaceae

***Flagellaria indica* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; 09°51'57"N, 126°00'36"E; 27.XI.2019; D. Tandang obs.; CBM19 508.

Family Gentianaceae

***Utania volubilis* (Wall.) M. Sugumaran**

Figure 4B

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'32"N, 126°00'31"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 201; USTH 015732.

Family Gnetaceae

***Gnetum gnemon* L.**

Figure 4C

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 546.

Family Goodeniaceae

***Scaevola taccada* (Gaertn) Roxb.**

Figure 4D

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 547.

Family Lamiaceae

***Premna serratifolia* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Bitoon; 09°47'09"N, 126°00'28"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio leg.; CBM19 015; USTH 015816.

***Volkameria inermis* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°55'11"N, 126°02'11"E; 29.XI.2019; D. Tandang obs.; CBM19 620.

Family Lauraceae

***Neolitsea villosa* (Blume) Merr.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 548.

Family Loranthaceae

***Amyema beccarii* (Tiegh.) Danser**

Figure 4E

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 551.

***Decaishina cumingii* (Tiegh.) Barlow**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 158; USTH 015700.

Family Lygodiaceae

***Lygodium circinnatum* (Burm. f.) Sw.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Domoyog; 10°01'43"N, 126°14'03"E; 25.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 269; USTH 015676.

Family Lythraceae

***Pemphis acidula* J.R. Forst. & G. Forst.**

Figure 4F

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Fernando; 09°54'23"N, 125°58'30"E; 25.VII.2019; C. Moran, J. Ordas, N. Moran, and G. Cortez leg.; CBM19 118; USTH 016070.

Identification. Densely branched, small shrubs up to 1 m tall. Leaves opposite, sessile or subsessile, succulent, elliptical to lanceolate, 5–10 × 1–3 cm. Flowers solitary or paired, white, 6–10 mm. Fruits not seen.

Commonly known as “bantigue”, *Pemphis acidula* is

native to coastal areas of the Indo-Pacific region. This species forms dense shrubberies on rocky substrates with *Acrostichum* L. species. near the shores of mangrove forests.

***Sonneratia alba* Sm.**

Figure 4G

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Fernando; 09°49'13"N, 125°58'23"E; 24.VII.2019; C. Moran, J. Ordas, N. Moran, and G. Cortez leg.; CBM19 121; USTH 015998.

Identification. Medium-sized trees up to 6–7 m tall, with pneumatophores. Leaves opposite, directed upward, leathery, obovate, 5–9 × 4–6 cm. Flowers and fruits not seen.

Commonly known as “pagatpat” or “pedada”, this mangrove species is native to the coastal areas of Southeast Asia. It is common in Siargao’s mangrove and rocky beach forest areas but tends to be solitary and does not form its own mangrove stands.

***Sonneratia caseolaris* (L.) Engl.**

Figure 4H

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Bitoon; 09°47'06"N, 126°00' 26"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio; leg.; CBM19 021; USTH 015828.

Identification. Medium-sized trees up to 5–7 m tall, with pneumatophores, branches noticeably drooping. Leaves opposite, leathery, ovate to oval, 5–12 × 1.8–5.0 cm. Flowers and fruits not seen.

Similar to *Sonneratia alba*, this mangrove species is also native to the coastal areas of Southeast Asia. In *S. caseolaris* the branches are noticeably drooping, and the flowers and fruits are distinct. It is commonly encountered in mangrove area and on rocky beaches on Siargao but trees are solitary.

Family Malpighiaceae

***Tristellateia australasiae* A. Rich.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 552.

Family Malvaceae

***Camptostemon philippinensis* (S. Vidal) Becc.**

Figure 4I

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°49'31"N, 125°57'36"E; 27.X.2022; J. Ordas, J. Bigotte, and A. Bedi leg.; IAO22 015; USTH 017581.

Identification. Stunted tree up to 1.5 m tall. Leaves arranged spirally, clustered at the end of the branches,

leathery, obovate, 5–8 × 3–4 cm. Flower buds in terminal cymes, 7–10 mm in diameter. Mature flowers and fruits not seen.

Camptostemon philippinensis, locally known as “gapas-gapas”, is found in several islands in the Philippines, with its distribution expanding to Sulawesi. It is quite alarming that we found only a single but stunted individual was encountered inhabiting an open tidal mudflat in Brgy. Del Carmen. It is Endangered (IUCN 2023).

***Sida rhombifolia* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°55'11"N, 126°02'11"E; 29.XI.2019; D. Tandang obs.; CBM19 625.

Family Melastomataceae

***Medinilla quadrifolia* Blume**

Figure 4J

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'50"N, 126°02'01"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 238; USTH 015768.

Identification. Scandent shrub up to 4 m tall. Leaves verticillate, membranous, ovate-elliptical, 8.5–12 × 5–6 cm. Flowers in axillary or solitary cymes, white, calyx cup-shaped, 6-merous, 17–20 mm long. Immature fruits berry, globose to subglobose often with flower remnants, greenish to white, 8–12 mm.

This species is native to Southeast Asia and is recorded in several Philippine islands. We record this species from Siargao Island for the first time. However, it is unusual for this species to thrive in secondary vegetation near mangrove areas, as it is known to occur in inland primary forested areas. Hence, some populations of this species display a degree of tolerance to anthropogenic disturbance.

***Medinilla teysmannii* Miq.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'33"N, 126°01'16"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 222; USTH 015753.

Identification. Shrub up to 1.5 m tall. Leaves opposite, coriaceous, ovate-elliptical, 22–26 × 13–16 cm. Flowers in terminal panicles, white, calyx urceolate, 5-merous, 23 mm. Fruits berry, globose to subglobose with persistent calyx, green to red, 10–15 mm.

This species also has a similar distribution to *M. quadrifolia*, and our record is the first time it has been found on Siargao Island. While *M. quadrifolia* thrives in lowland primary forests, this species occurs in upper montane forests near streams, rivers, and ridges. However, we observed individuals inhabiting rocky substrates near mangrove species on the shore. Therefore,

populations of this species may exhibit a broader niche and some tolerance to disturbance. The flowers and leaves are edible and taste sour.

***Melastoma malabathricum* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 554.

***Memecylon ovatum* Sm.**

Figure 4K

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 556.

Family Meliaceae

***Xylocarpus granatum* J. Koenig**

Figure 4L

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'33"N, 126°01'16"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 219; USTH 015751.

Identification. Small to medium-sized trees up to 4–9 m tall. Leaves bipinnately compound, opposite, leaflets obovate, 8–14 × 4–7 cm. Flowers in axillary panicles, sometimes terminal, white, 10–13 mm. Fruits large, globose, greenish to brown in maturity, 10–12 cm in diameter.

Locally known as “tabigi”, this native mangrove tree is common throughout the mangrove swamps in the country.

Family Moraceae

***Artocarpus blancoi* (Elmer) Merr.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'37"N, 126°00'32"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 175; USTH 015714.

Identification. Large trees reaching up to 5–20 m tall. Leaves alternate-spiral, margins entire, pinnatifid with 1–3 lobes, slightly pubescent, elliptical to ovate, 25–57 × 20–45 cm. Flowers in leaf axils, with separate male and female inflorescences, 10–18 × 1.4–1.6 cm, male inflorescences oblong-cylindric, female inflorescences subglobose. Fruits yellow to orange-brown in maturity, spined, ellipsoid, 8–13 × 5–6 cm

Also known as “antipolo”, this endemic species of the Philippines is commonly found in lowland and medium-altitude forests. Although it is categorized as Least Concern, its populations are in decline (IUCN 2023).

***Artocarpus multifidus* F.M. Jarrett**

Figure 5A

Materials examined. PHILIPPINES – **Surigao del**

Norte • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 557.

***Artocarpus ovatus* Blanco**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 558.

***Ficus nota* (Blanco) Merr.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 559.

***Ficus pedunculosa* Miq.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Cabugao; 09°54'33"N, 125°59'07"E; 26.VIII.2019; G. Cortez leg.; CMB19 414; USTH 016103.

***Ficus pseudopalma* Blanco**

Figure 5B

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; 09°51'57"N, 126°00'36"E; 27.XI.2019; D. Tandang obs.; CBM19 510.

***Ficus septica* Burm. f.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 561.

Family Muntingiaceae

***Muntingia calabura* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 486.

Family Myrtaceae

***Decaspermum parviflorum* (Lam.) A.J. Scott**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 562.

***Syzygium alcinae* (Merr.) Merr. & L.M. Perry**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez obs.; CBM19 151.

***Syzygium confertum* (Korth.) Merr. & L.M. Perry**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; 09°51'55"N, 125°59'46"E; 23.VII.2019; C. Moran, J. Ordas, and N. Moran obs.; CBM19 083.

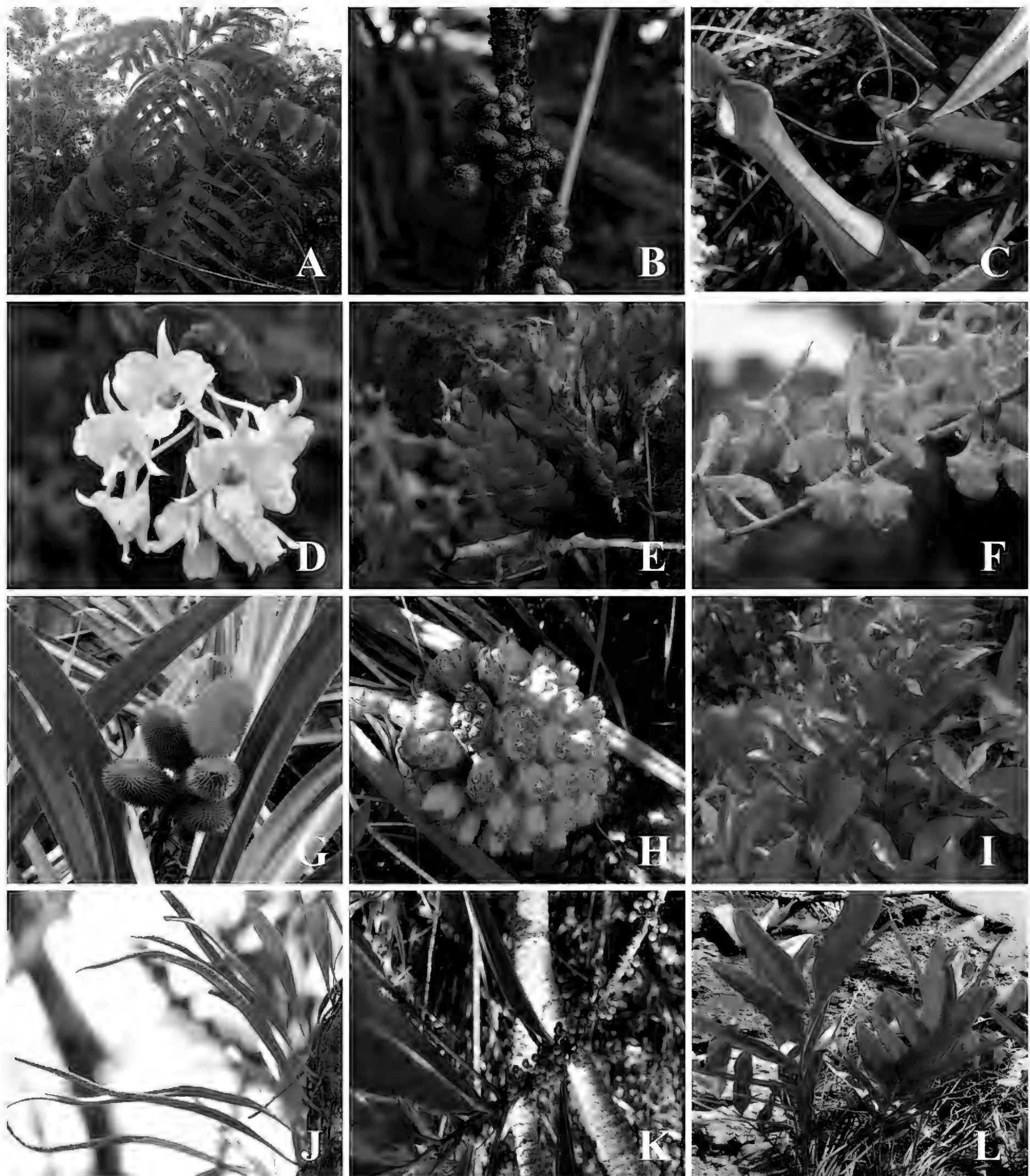


Figure 5. Native and endemic species of Del Carmen, Siargao. **A.** *Artocarpus multifidus* **B.** *Ficus pseudopalma*. **C.** *Nepenthes abgracilis*. **D.** *Dendrobium dearie*. **E.** *Dendrobium lunatum*. **F.** *Renanthera storiei*. **G.** *Benstonea copelandii*. **H.** *Pandanus tectorius*. **I.** *Glochidion woodii*. **J.** *Pyrrosia lanceolata*. **K.** *Myrsine mindanaensis*. **L.** *Acrostichum speciosum*.

Family Nepenthaceae

***Nepenthes abgracilis* Jebb & Cheek**

Figure 5C

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 157; USTH 015699.

Identification. Terrestrial vine up to several meters long.

Leaves spirally arranged, narrowly oblong, 23–25 × 3 cm. Pitcher traps arising from leaf tendrils subcylindrical, 16 × 5 cm, pitcher mouth ovate, 6 × 4 cm, with faint ridges.

This species was only known from its type locality in the submontane forests of Mount Legaspi on Surigao and is commonly compared to another species, *N. gracilis* Korth. However, *N. abgracilis*, which climbs on stunted trees in coastal vegetation, is relatively common in the area. This is a new habitat observation for this species and the first record from Siargao Island.

Family Oleaceae

***Chionanthus ramiflorus* Roxb.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 563.

Family Orchidaceae

***Arachnis flos-aeris* (L.) Rchb. f.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'50"N, 126°02'01"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez obs.; CBM19 232.

***Bulbophyllum apodum* Hook. f.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°55'11"N, 126°02'11"E; 29.XI.2019; D. Tandang obs.; CBM19 642.

***Dendrobium dearei* Rchb. f.**

Figure 5D

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°55'11"N, 126°02'11"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 215; USTH 015747.

***Dendrobium escritorii* Ames**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 564.

***Dendrobium lunatum* Lindl.**

Figure 5E

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'33"N, 126°01'16"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 217; USTH 015749.

Identification. Epiphyte. Leaves rigid, with apices pointing toward the stem, lanceolate, 2.6–2.8 × 0.6–7.0 cm. Flowers emerging from leaf bases, tepals white, translucent with purple veins and bases, lip white with a yellowish base, cuneate. Fruits not seen.

This endemic orchid species is known only from several provinces, including Quezon, Palawan, and Leyte. Our observation of this orchid species is the first record from Siargao Island.

***Dendrobium merrillii* Ames**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 566.

***Dendrobium secundum* (Blume) Lindl. ex Wall.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'50"N, 126°02'01"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 185; USTH 015722.

Identification. Erect to semipendulous sympodial epiphyte. Leaves alternate, margins entire, oblong-lanceolate, 10.0 × 2.5 cm. Flowers numerous, around 50, arranged around its rachis, pink to purple, labellum ovate, curling towards the column, bright orange, dorsal sepal lanceolate, lateral sepals ovate, forming a spur at its base, petals oblong-lanceolate. Fruits not seen.

This endemic species is widely known as the toothbrush orchid due to the arrangement of its flowers. We often encountered it on several trees in beach forests in Del Carmen.

***Renanthera storiei* Rchb. f.**

Figure 5F

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 567.

Family Pandanaceae

***Benstonea affinis* (Kurz) Callm. & Buerki**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Domoyog; 10°01'43"N, 126°14'03"E; 25.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 275; USTH 015684.

***Benstonea copelandii* (Merr.) Callm. & Buerki**

Figure 5G

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 568.

Identification. Small shrubs to small trees reaching up to 1–4 m tall. Leaves, linear and tapering, margin and midrib at the abaxial side toothed, 50–200 × 2–7 cm. Fruits 4–6 borne in a terminal or lateral inflorescence, syncarpous, hard and very spiny, bright orange, 8–11 cm.

Locally known as “bariw”, this endemic species occurs mostly in different parts of Mindanao, within low to highland tropical rainforests reaching 1000 m. However, it also occurs in beach forests, swamps, and along mangal areas. If reproductive parts are absent, it can be easily confused with other species of Pandanaceae occurring sympatrically in the area. Still, it can be distinguished by the presence of adaxially located spines along its pleats on its apices. While it is known to have similar common names as other species of Pandanaceae in the area, it is not typically used as raw material for handicrafts. This species is recorded here for the first time from Siargao Island.

***Pandanus tectorius* Parkinson ex Du Roi**

Figure 5H

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen, Brgy. San Jose; 09°52'44"N, 125°57'25"E; 25.VII.2019; C. Moran, J. Ordas, N. Moran, and G. Cortez leg.; CBM19 318; USTH 016044.

Identification. Shrubs to medium-sized trees up to 2–4 m tall. Leaves alternating, linear and tapering, margin and midrib at the abaxial side toothed, 100–150 × 2–7 cm. Fruits 1–3 borne in a lateral inflorescence, syncarpous, fruitlets hard, bright orange, 18–20 cm in diameter.

Known by the locals loosely as “pandan” or “bariw”, this beach forest species is widely distributed across Oceania towards Southeast Asia. While it is commonly cultivated in coastal communities across different Philippine islands as an ornamental tree or as a source of raw materials for handcrafted items, it was rarely observed in Del Carmen. Its fruitlets are morphologically variable.

***Sararanga philippinensis* Merr.**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 569.

Identification. Tall trees reaching up to 10–15 m tall. Leaves alternating, linear and tapering, margin and midrib at the abaxial side toothed, 200 × 7 cm. Fruits numerous in infructescences, berry-like, yellow to orange, 6–8 mm.

Only two species are known in this genus, and *S. philippinensis* is endemic to the Philippines. It is currently listed as Near Threatened by the IUCN (2023) with population in decline. It occurs in coastal vegetation and is locally known as “malapandan” or “bariw”. This species is newly recorded from Siargao Island.

Family Passifloraceae

***Passiflora foetida* L.**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'29"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 487.

Family Phyllanthaceae

***Glochidion album* (Blanco) Boerl.**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 643.

***Glochidion littorale* Blume**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'30"N, 126°01'23"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 260; USTH 015741.

Identification. Medium-sized trees up to 6 m tall. Leaves alternate, margins entire, coriaceous, apex rounded, base obovate, 4–7 × 3–4 cm. Flowers in axillary clusters, with male and female apetalous flowers. Fruits globose capsules, green to yellowish, but red in maturity.

This mangrove-associate species is a native species commonly found in seashores and along tidal streams.

***Glochidion woodii* Merr.**

Figure 5I

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen, Brgy. Bitoon; 09°47'09"N, 126°00'28"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio, leg.; CBM19 031; USTH 015847.

***Moeroris amara* (Schumach. & Thonn.) R.W. Bouman**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; 09°51'57"N, 126°00'36"E; 27.XI.2019; D. Tandang obs.; CBM19 511.

Family Plantaginaceae

***Scoparia dulcis* L.**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 488.

Family Poaceae

***Chloris barbata* Sw.**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 489.

***Cynodon dactylon* (L.) Pers.**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 490.

***Digitaria setigera* Roth**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 491.

***Dinochloa luconiae* (Munro) Merr.**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'32"N, 126°00'31"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM 19 200; USTH 016113.

***Eleusine indica* (L.) Gaertn.**

Materials examined. PHILIPPINES – Surigao del Norte • Siargao Island, Municipality of Del Carmen; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 492.

***Imperata cylindrica* (L.) P. Beauv.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'30"N, 126°01'23"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 261; USTH 015787.

***Saccharum spontaneum* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 493.

Family Polypodiaceae

***Aglaomorpha quercifolia* (L.) Hovenkamp & S. Linds**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°55'11"N, 126°02'11"E; 29.XI.2019; D. Tandang obs.; CBM19 644.

***Pyrrosia lanceolata* (L.) Farw**

Figure 5J

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°55'11"N, 126°02'11"E; 29.XI.2019; D. Tandang obs.; CBM19 645.

Family Portulacaceae

***Portulaca oleracea* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; 09°51'57"N, 126°00'36"E; 27.XI.2019; D. Tandang obs.; CBM19 513.

Family Primulaceae

***Ardisia elliptica* Thunb.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°47'09"N, 126°00'28"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio leg.; CBM19 028; USTH 015842.

***Aegiceras floridum* Roem. & Schult.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Fernando; 09°49'13"N, 125°58'23"E; 24.VII.2019; C. Moran, J. Ordas, N. Moran, and G. Cortez leg.; CBM19 120; USTH 015953.

Identification. Medium-sized shrubs to small trees reaching up to 2 m tall. Leaves alternate, margins entire, texture glabrous, apex rounded to slightly emarginate, base cuneate, 3–10 cm × 2–5 cm. Flowers with five petals, white, pointed, contorted, 4–5 mm long. Fruits in simple umbels of red to yellowish red, long, 1-seeded capsules, apex pointed, 3–7 cm long.

Also known as “saging-saging” due to the banana-like appearance of its fruits. This species is slightly smaller than *Aegiceras corniculatum* (L.) Blanco. It is usually found in rocky substrates along the shores and

mudflats.

***Myrsine mindanaensis* (Elmer) Pipoly**

Figure 5K

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'30"N, 126°01'23"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 257; USTH 015764.

Identification. Medium-sized to large trees, 8–12 m tall. Leaves alternate, margins entire, apex obtuse, base acuminate, 4.0–9.5 × 2.5–3.0 cm. Flowers in umbels, sessile, white with red tinges on petals. Fruits green, purple when mature, globose, 2–3 cm in diameter.

This is an endemic species to the Philippines, inhabiting lower to upper montane forests. However, we found several populations of this species near mangrove species in four barangays in Del Carmen. Thus, our data include a new habitat records for this species and the first time that it has been reported from Siargao Island.

Family Pteridaceae

***Acrostichum aureum* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 162; USTH 015704.

Identification. Small ferns less than 1 m tall. Leaves pinnately compound, leaflets alternate, margin undulating, leathery, apex acute, base oblique to rounded, 10–13 × 2–4 cm. Upper pinnae smaller, covered with dark brown sori on their abaxial sides, lower pinnae are larger without sori.

Also known as “palaypay”, these mangrove associates are often associated with brackish swamps, mangrove forests, and drainage canals. They are sometimes referred to as a weed for they prevent mangrove recolonization.

***Acrostichum speciosum* Willd.**

Figure 5L

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; 09°51'57"N, 126°00'36"E; 23.VII.2019; C. Moran, J. Ordas, and N. Moran leg.; CBM19 067; USTH 015900.

Identification. Small ferns less than 1 m tall. Leaves pinnately compound, leaflets alternate, margin undulating, leathery, apex acuminate to acute, base oblique to rounded, 8–10 × 1.5–3.0 cm. Upper pinnae smaller, covered with dark brown sori on their abaxial sides, lower pinnae are larger without sori.

This mangrove fern is often confused with its ally, *A. aureum*, for they share similar morphological characteristics. However, this species has a smaller leaf size and more pointed leaflets. It is also proven to be more

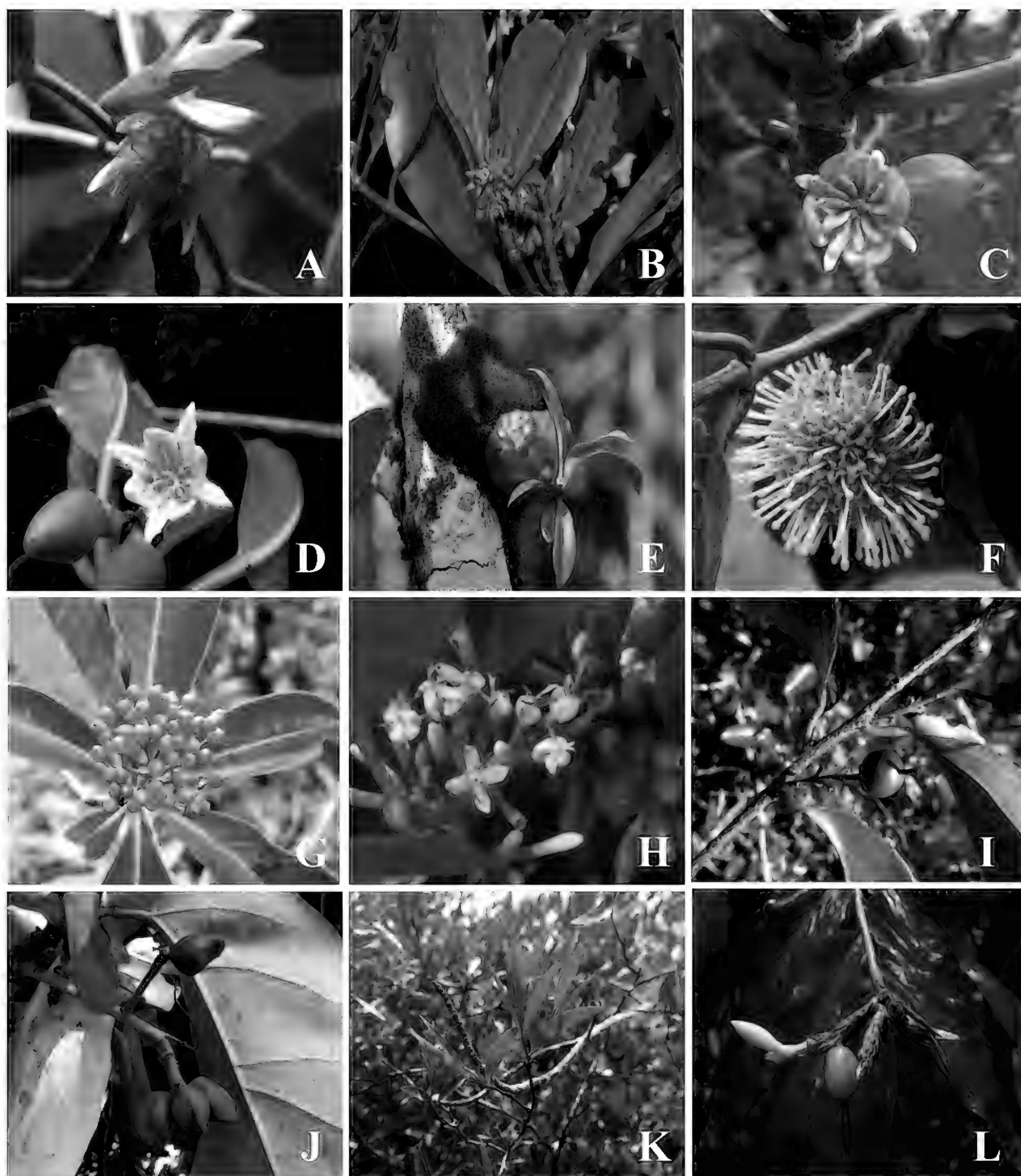


Figure 6. Native and endemic species of Del Carmen, Siargao. **A.** *Bruguiera gymnorhiza* **B.** *Ceriops tagal*. **C.** *Rhizophora apiculata*. **D.** *Rhizophora mucronata*. **E.** *Myrmecodia tuberosa*. **F.** *Neonauclea formicaria*. **G.** *Psychotria gitingensis*. **H.** *Scyphiphora hydrophyllacea*. **I.** *Scolopia luzonensis*. **J.** *Heritiera littoralis*. **K.** *Wikstroemia indica*. **L.** *Alpinia elegans*.

salt tolerant and uncommon in freshwater areas.

Family Rhamnaceae

***Alphitonia excelsa* (Fenzl) Reissek ex Endl.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 572.

Family Rhizophoraceae

***Bruguiera gymnorhiza* (L.) Lam.**

Figure 6A

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Bitoon; 09°46'47"N, 126°00'20"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio leg.; CBM19 011; USTH 015806.

Identification. Medium to tall trees reaching up to 7–10 m tall, with pneumatophores of submersed origins. Leaves decussate, margins entire, coriaceous, dark

green, elliptical, $8-15 \times 4-6$ cm. Flowers solitary, white, borne in red to pinkish calyces. Propagules dark green to brownish, narrowly cylindrical, elongated, 5–10 cm long.

Bruguiera gymnorhiza, locally known as “pototan” or “busain”, is a mangrove species native to the Old World tropics. In the study sites, they occur sympatrically with *Rhizophora* species in mangrove stands but with few individuals.

***Ceriops tagal* (Perr.) C.B. Rob.**

Figure 6B

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; $09^{\circ}49'28''\text{N}$, $126^{\circ}00'12''\text{E}$; 23.VII.2019; C. Moran, J. Ordas, and N. Moran leg.; CBM19 056; USTH 015885.

Identification. Small trees up to 5 m tall, with pneumatophores of submersed origin. Leaves decussate, margins entire, light green, obovate, $7-10 \times 2-4$ cm. Flowers numerous, pendulous, white, with indumentum, 4–6 cm. Propagules green to brownish, narrowly cylindrical, elongated, 5–20 cm long.

Locally known as “tangel” This species has a widespread pantropical distribution, inhabiting mudflats and saline creeks. Unlike other species of *Rhizophoraceae*, it does not form dense mangrove stands but is occasionally encountered in inner mangrove sites.

***Rhizophora apiculata* Blume**

Figure 6C

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; $09^{\circ}49'31''\text{N}$, $126^{\circ}00'09''\text{E}$; 23.VII.2019; C. Moran, J. Ordas, and N. Moran leg.; CBM19 058; USTH 015887.

Identification. Medium-sized trees up to 7 m tall, with extensively developed, aerial, trunk-borne stilt roots. Leaves decussate, margins entire, coriaceous, light green, elliptical, $8-20 \times 5-7$ cm. Flowers in twos or threes within or below leaf axils below the apical shoot, creamy white, glabrous. Propagules light green to light brown, narrowly cylindrical, elongated, 10–50 cm long.

Rhizophora apiculata has a widespread pantropical distribution and inhabits coastal areas, tidal creeks, and estuaries. This species is locally known as “bakhaw lalaki” and is abundant in the study areas, forming dense mangrove stands with *R. mucronata*. The locals commonly plant this species.

***Rhizophora mucronata* Lam.**

Figure 6D

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; $09^{\circ}49'37''\text{N}$, $126^{\circ}00'13''\text{E}$; 23.VII.2019; C. Moran, J. Ordas, and N. Moran leg.; CBM19 060; USTH 015883.

Identification. Medium-sized trees up to 7 m tall, with extensively developed areal trunk-borne stilt roots.

Leaves decussate, margins entire, coriaceous, light green, elliptical, $8-20 \times 5-7$ cm. Flowers numerous in leafy rosettes, creamy white, with distinct indumentum. Propagules light green to light brown, narrowly cylindrical, elongated, 50–70 cm long.

Like *Rhizophora apiculata*, this species has a widespread pantropical distribution and occurs sympatrically with the former. Locally known as “bakhaw babae”, this species comprises most of the Del Carmen Mangrove Forest. It forms most of the monotypic zonations in the study areas and is the commonly used species for mangrove tree planting projects. The locals commonly plant this species.

Family Rubiaceae

***Gardenia mutabilis* Reinw. ex Blume**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; $09^{\circ}52'39''\text{N}$, $126^{\circ}00'32''\text{E}$; 25.XI.2019; D. Tandang obs.; CBM19 407.

***Guettarda speciosa* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; $09^{\circ}55'11''\text{N}$, $126^{\circ}02'11''\text{E}$; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 205; USTH 015733.

***Hedyotis pruinosa* Wight & Arn.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; $09^{\circ}51'57''\text{N}$, $126^{\circ}00'36''\text{E}$; 27.XI.2019; D. Tandang obs.; CBM19 515.

***Hydnophytum formicarum* Jack**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; $09^{\circ}52'32''\text{N}$, $126^{\circ}00'31''\text{E}$; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 183; USTH 015720.

***Ixora macrophylla* Bartl. ex DC.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; $09^{\circ}52'34''\text{N}$, $126^{\circ}00'28''\text{E}$; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 194; USTH 015709.

Identification. Medium-sized tree up to 5 m tall. Leaves opposite, margins entire, coriaceous, elliptical to lanceolate, $5-18 \times 3-7$ cm. Flowers in cauliflorous or rami-florous, pendulous inflorescences, numerous, white but with pink tinges borne on red calyces, glabrous. Fruits berry-like, pinkish to purple, subglobose, 8–10 mm.

Ixora macrophylla is an endemic species with a wide distribution across several islands in the Philippines. Its long, cauliflorous inflorescences easily distinguish it. It typically occurs within tropical rainforests, but it is also observed to thrive in limestone rocks of beach forests, as seen on Siargao Island.

***Morinda citrifolia* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Fernando; 09°49'13"N, 125°58'32"E; 28.XI.2019; D. Tandang obs.; CBM19 599.

***Mussaenda philippica* A. Rich.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 494.

***Myrmecodia tuberosa* Jack**

Figure 6E

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'32"N, 126°00'31"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 182; USTH 015705.

Identification. Epiphytic myrmecophytic shrub up to 30–60 cm long. Tubers large with indumentum on the outer surface and large inner cavities. Leaves opposite, margins entire, coriaceous, narrowly oblong, 7–30 × 3–10 cm. Flowers and fruits not seen.

Myrmecodia tuberosa is an abundant ant-plant species occurring as epiphytes of mangrove trees, such as *R. apiculata*, *R. mucronata*, and *B. gymnorhiza*. Our records are the first from Siargao Island and Mindanao.

***Neonauclea calycina* (Bartl. ex DC.) Merr.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°50'52"N, 126°01'43"E; 25.XI.2019; D. Tandang obs.; CBM19 576.

***Neonauclea formicaria* (Elmer) Merr.**

Figure 6F

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Jose; 09°52'56"N, 125°57'24"E; 25.VII.2019; C. Moran, J. Ordas, N. Moran, and G. Cortez leg.; CBM 19 348; USTH 016066.

Identification. Small to medium-sized tree up to 6 m tall. Terminal branches swollen, inhabited by formicine ants. Leaves opposite, margins entire, coriaceous, broadly elliptical, 15–25 × 8–20 cm. Flowers in dense spikes with a diameter across corollas of 4–7 cm, white, style conspicuously exerted for 9 mm. Fruits dry woody syncarps, 3–4 cm.

Locally known as “balud” or “humbabalud” in the area, this myrmecophytic species is endemic to the Philippines and is restricted to Visayas and Mindanao islands. It is usually found along forest edges, road cuttings and clearings, cliff edges, and beach forests. Populations of this species are also found in coastal vegetation. This is the first time that it has been reported from Siargao Island.

***Psychotria gitingensis* Elmer**

Figure 6G

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°50'52"N, 126°01'43"E; 24.X.2022; G. Cortez, J. Ordas, S. Zamudio, C. Ting, E. Odulio, C. Moran, J. Bigotte, and A. Bedi leg.; IAO22 001; USTH 017171.

Identification. Tall shrubs to medium-sized trees up to 5 m tall. Leaves opposite, margins entire, very coriaceous with prominent nerves beneath, obovate to oblong, 5–14 × 3–5 cm. Flowers in dense terminal inflorescences, white, 2–3 mm. Fruits drupes, orange to purple, subglobose to slightly obovate, 6–7 mm.

This endemic species occurs within lowland tropical rainforests to high montane forests reaching 1000 m. It is also observed in swamps and mangal areas, especially in limestone substrates of Siargao Island.

***Scyphiphora hydrophylacea* C.F. Gaertn.**

Figure 6H

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Bitoon; 09°47'06"N, 126°00'26"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio leg.; CBM19 016; USTH 015800.

Identification. Small to medium-sized shrubs up to 3 m. Leaves opposite, margins entire, coriaceous, elliptical to obovate, 3–5 × 1–3 cm. Flowers in lateral cymes, white to slightly pink, 3–4 mm. Fruits berry-like, bright green, ellipsoid with longitudinal ridges, 8–10 mm.

This true mangrove species has an extensive distribution ranging from India to tropical Asia to Oceania. This species is commonly encountered in shorelines and mangrove areas of Del Carmen, often inhabiting rocky substrates. It does not form dense stands and is often encountered in groups of relatively few individuals.

***Spermacoce ocymoides* Burm. f.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Antipolo; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 495.

***Timonius finlaysonianus* (Wall. ex G. Don) Hook. f.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Bitoon; 09°47'09"N, 126°00'28"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio leg.; CBM19 027; USTH 015833.

Family Rutaceae

***Melicope frutescens* (Blanco) Appelhans & J. Wen**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 577.

***Murraya paniculata* (L.) Jack**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 578.

Family Salicaceae

***Allophylus cobbe* (L.) Raeusch.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Bitoon; 09°47'09"N, 126°00'28"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio leg.; CBM19 030; USTH 015823.

***Casearia fuliginosa* (Blanco) Blanco**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Jose; 09°52'56"N, 125°57'24"E; 25.VII.2019; C. Moran, J. Ordas, N. Moran, and G. Cortez leg.; CBM19 332; USTH 016065.

***Casearia grewiifolia* Vent.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 496.

***Guioa diplopetala* (Hassk.) Radlk**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 23.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 160; USTH 015702.

***Scolopia luzonensis* Warb.**

Figure 6I

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'37"N, 126°00'32"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 172; USTH 015711.

Family Selaginellaceae

***Selaginella delicatula* (Desv. ex Poir.) Alston**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°55'11"N, 126°02'11"E; 29.XI.2019; D. Tandang obs.; CBM19 646.

Family Solanaceae

***Capsicum annuum* L.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 580.

Family Sterculiaceae

***Heritiera littoralis* Aiton**

Figure 6J

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Esperanza; 09°52'56"N, 125°57'24"E; 25.VII.2019; C. Moran, J. Ordas, N. Moran, and G. Cortez leg.; CBM19 325; USTH 016055.

Identification. Tall trees up to 20 m or more. Leaves alternate-spiral, margins entire, texture coriaceous, apex obtusely pointed, base slightly-cordate, 10–20 cm by 5–10 cm. Flowers not seen. Fruits in pendulous clusters of green, one-seeded ellipsoidal, flattened on one side, 6–8 cm × 5–6 cm.

Known by the locals as “dungon”, this species is viewed with conflicting floral categorization as a true mangrove or a mangrove associate species. It is known to thrive in terrestrial environments and is not exclusive to mangal environments.

***Sterculia ceramica* R. Br**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'50"N, 126°02'01"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 227; USTH 015755.

Family Taccaceae

***Tacca palmata* Blume**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. San Fernando; 09°56'50"N, 126°02'01"E; 28.XI.2019; D. Tandang obs.; CBM19 602.

Family Thymelaeaceae

***Wikstroemia indica* (L.) C.A. Mey**

Figure 6K

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°56'50"N, 126°02'01"E; 24.VII.2019; S. Zamudio, C. Caguioa, and M. Rodriguez leg.; CBM19 230; USTH 015744.

Family Urticaceae

***Pipturus arborescens* (Link) C.B. Rob.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Del Carmen; 09°55'11"N, 126°02'11"E; 29.XI.2019; D. Tandang obs.; CBM19 647.

Family Verbenaceae

***Phyla nodiflora* (L.) Greene**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen; 09°49'28"N, 126°00'12"E; 25.XI.2019; D. Tandang obs.; CBM19 497.

***Stachytarpheta jamaicensis* (L.) Vahl**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen; 09°47'09"N, 126°00'28"E; 21.VII.2019; C. Moran, J. Ordas, and S. Zamudio leg.; CBM19 029; USTH 015844.

Family Vitaceae

***Leea manillensis* Walp.**

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen, Brgy. Katipunan; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 582.

Family Zingiberaceae

***Alpinia elegans* (C. Presl) K. Schum.**

Figure 6L

Materials examined. PHILIPPINES – **Surigao del Norte** • Siargao Island, Municipality of Del Carmen; 09°52'39"N, 126°00'32"E; 25.XI.2019; D. Tandang obs.; CBM19 583.

Identification. Tall herbs up to 2–4 m tall. Leaves drooping, alternate, margins entire and slightly undulating, leathery, narrowly elliptical to oblong-lanceolate, 25–30 × 5–7 cm. Flowers in terminal inflorescences, white, 4–5 cm. Fruits capsule with a persistent calyx, bright orange when ripe, ellipsoid to subglobose, 3–4 cm.

Alpinia elegans is an endemic species, but with a wide distribution across the Philippines, mostly occurring in low to medium-elevation forests along streams. On Siargao, this species is encountered in the mangal areas of Brgys. Katipunan and San Fernando, particularly on moist soils along streams that empty to the beach. We report this species for the first time from Siargao and the Mindanao region. *Alpinia elegans* is categorized as Vulnerable (IUCN 2023).

Discussion

Wetland ecosystems provide substantial ecological and economic services to numerous organisms, including humans. In the Philippines, the Del Carmen mangrove forest on Siargao supports a wide array of invertebrate and vertebrate fauna. It provides essential services to local communities, including storm protection, food, ecotourism, etc. However, floristic data remain limited despite this reliance on this valuable ecosystem. Our study of mangal areas of Del Carmen addresses this scarcity of data with extensive botanical expeditions.

Our results reveal a diverse floral composition in the Del Carmen municipality, accounting for 165 species of mostly trees, shrubs, and herbs. Because of the lack of published data and few species recorded only in their type localities, 80% of these are considered new recorded from Siargao Island, and 9% are new additions to the Mindanao flora. Twenty (20) true mangroves are found in the region, comprising almost half (47.61%) of the 42 true mangroves recorded in the Philippines. This number is relatively lower compared to other explored

mangrove forests, such as in Davao Oriental (31 species; Pototan et al. 2021) and Palawan (28 species; Dangan-Galon et al. 2016), but higher compared to Davao del Sur (12 species; Jumawan et al. 2015), Dinagat Island (10 species; Cañizares and Seronay 2016), and Samar (eight species; Abino et al. 2013). However, the floral diversity and species compositions of these surveyed areas vary greatly.

Most species recorded in the surveys comprise native species (86%), and a small composition of Philippine endemic species exists (11.51%). Areas in the municipality with the presence of endemic species include barangays Del Carmen and Katipunan, which can support mangrove associates beach forest and other terrestrial species in their mangal areas. Most species found in our surveys have not been not evaluated by the IUCN (2023) due to limited data. However, we believe that the unassessed endemic species tend to be more threatened with extinction than those already assessed as threatened by the IUCN.

We commonly encountered six species in all areas surveyed due to their abundance, namely *Rhizophora mucronata*, *R. apiculata*, *Nypa fruticans*, *Myrmecodia tuberosa*, *Avicennia officinalis*, and *Myrsine mindanensis*. The distribution and dominance of *R. mucronata* and *R. apiculata* are significantly greater than other dominating species. Including *N. fruticans*, these three species play essential roles in forming the Del Carmen Mangrove Forest by forming monotypic zonation. In barangays Cabugao, Katipunan, and Lobogon, *N. fruticans* dominate their estuarine banks. *Rhizophora* species dominate almost all 11 barangays from landward to seaward zones, and *Rhizophora* zonation shape the overall contiguous forests in Del Carmen, Siargao. Lastly, the epiphytic ant plant *M. tuberosa* is commonly observed in *Rhizophoraceae* trees, with as many as 1–5 individuals per tree.

The dominance of *Rhizophora* and *Avicennia* can be attributed to their reiteration capacity. *Rhizophora* species can reorient their roots, whereas *Avicennia* coppices when subjected to environmental stress. The former cannot coppice due to the loss of reserve meristem production (Tomlinson 2016). Nevertheless, the coasts of Del Carmen were conducive to the opportunistic root branching of *Rhizophora*, hence the formation of extensive zonation. Tidal inundation induces proliferative branching, and their roots are not constrained to substrates as litterfall alone provides adequate nutrients (Rabinowitz 1978).

Based on our diversity analyses, barangays Del Carmen and Katipunan exhibit the highest floral composition and diversity based on the five indices. Results of the ENS index suggest that barangay Del Carmen is more than eight times more diverse than barangays Cabugao, Lobogon, and Mabuhay, whereas Katipunan is three times more diverse than Bitoon. Barangays Domoyog and Esperanza are two times more diverse than Antipolo. Given that the floristic diversity of mangroves relying on Shannon and Simpson's indices alone

may underestimate the overall composition and thus may lead to inconclusive definitions for the community being studied (Hurlbert 1971). Pielou's Evenness (J') reveals similar patterns, wherein barangays Del Carmen and Katipunan exhibited the highest resulting values, which was expected due to their high species richness and number of individuals. These two barangays have larger mangal areas associated with terrestrial environments, thus capable of supporting diverse life forms. In contrast, barangays closer to the sea (e.g. barangays Cabugao, Lobogon, and Mabuhay) or island barangays (e.g. Domoyog and San Fernando) are primarily enclosed in *Rhizophora* zonations resulting in very low diversity with little to no endemism.

The mangal areas of the municipality of Del Carmen, Siargao Island is home to a more diverse floral assemblage than previously thought. Our results find that barangays Del Carmen and Katipunan harbor the greatest floral compositions and diversities compared to the other nine barangays, with *Rhizophora* species as the dominating species forming large monotypic zonations. Our extensive survey spearheaded the firsthand information on its mangal areas, and this species list can guide biologists in the future. Our findings may be essential in generating conservation plans for protecting this extensive wetland ecosystem, which exhibits irreplaceable ecological, economic, and cultural importance as well as immeasurable intrinsic values.

Acknowledgements

We extend our gratitude to Louise Abigail de Loyola, Nero Moran, Ariel Bato, Ariel Gonzales for their invaluable participation in the fieldwork; to Deny Comon of Siargao Islands Wildlife Conservation, Inc. (SIWCFI), Chito Dugan of Sentro para sa Ikauunlad ng Katutubong Agham at Teknolohiya Inc. (SIKAT), Gina Mozo Barquilla of Municipal Environment and Natural Resources Office, and Del Carmern Siargao Municipal Mayors Alfredo M. Coro II and Proserfina M. Coro for their local support and assistance; and to the institutions, National Research Council of the Philippines (NRCP) - Department of Science and Technology, Department of Environment and Natural Resources - CARAGA Region, National Museum of the Philippines - Philippine National Herbarium, UST Herbarium, UST Research Center for Applied and Natural Sciences, and Department of Science and Technology - Science Education Institute (DOST-SEI). Furthermore, we are grateful to the reviewers and subject editor for improvements to our manuscript.

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Resources: CBM. Supervision: CBM. Visualization: GNGC, JADO, SGSZ, DNT. Project administration: CBM. Software: GNGC. Validation: DNT, CBM. Writing – original draft: GNGC. Writing – review and editing: GNGC, JADO, SGSZ, CDDC, MAAR, DNT, RRR, CBM.

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